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QUATERNARY GEOLOGY OF SOUTHERN MELVILLE PENINSULA, NUNAVUT

L.A. Dredge

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QUATERNARY GEOLOGY OF SOUTHERN MELVILLE PENINSULA, NUNAVUT:
surface deposits, glacial history, environmental geology, and till geochemistry

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W.E. Parry's cairn on raised marine deposits on Winter Island. Photograph by L.A. Dredge. GSC 1997-43NN

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A.S. Dyke

Author's address
L.A. Dredge
Terrain Sciences Division
Geological Survey of Canada
601 Booth Street, Room 125
Ottawa, Ontario
K1A 0E8

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QUATERNARY GEOLOGY OF SOUTHERN MELVILLE PENINSULA, NUNAVUT: surface deposits, glacial history, environmental geology, and till geochemistry

Abstract

Quaternary glaciations have created sandy granitic till, calcareous silty till, calcareous glaciomarine deposits, raised marine beaches, and scoured rock outcrop. Accompanying maps are used to reconstruct glacial history.

Limestone erratics on uplands suggest extensive Foxe Ice prior to the last glaciation. Clay minerals in regolith and upland block fields indicate an ensuing weathering interval, followed by a periglacial period. During the Foxe (=Wisconsin) Glaciation, ice on uplands coalesced to form a local ice sheet (Melville Ice). This ice sheet was later subsumed by Foxe Ice, although a subsidiary divide persisted on the peninsula, blocking and diverting Foxe Ice flow. Cold-based zones and local ice divides preserved the regolith on the plateaus. Some areas gradually became warm-based. Deglaciation began with penetration of a marine re-entrant south of Wales Island about 8600 years ago, with ice streaming through Rae Isthmus and development of Melville Moraine as far south as Matheson River. Marine limit elevations suggest rapid, progressive breakup of Foxe Ice 6800–7000 years ago. Ice remaining on the peninsula flowed radially to the coasts as late as 6400 years ago, and gradually retreated inland. Remnants eventually stagnated near Haviland Bay and Aua River. Abundant subglacial and ice-marginal meltwater features characterized deglaciation.

Geochemical signatures from till and gossan samples are related to rock lithology, directions and styles of glacial transport, and length of time available for weathering. Tills within areas controlled by Foxe Basin ice are far-travelled, while those beneath the Melville Ice divide reflect the composition of underlying rock types. Lead/zinc ratios in regolith, till, and gossans indicate postglacial geochemical reactivity. Gossans associated with Zn, Cd, Ni, and Cu anomalies are preferentially found in rocks of the Prince Albert Group, and schist-marble contacts in the Penrhyn Group.

Résumé

Les glaciations du Quaternaire ont produit du till sableux de source granitique, du till silteux de composition calcareuse et des dépôts glaciomarins de composition calcareuse, formé des plages marines aujourd'hui soulevées et affouillé les affleurements rocheux. Les cartes qui accompagnent le présent bulletin permettent de reconstituer l'histoire glaciaire.

La présence de blocs erratiques de calcaire sur les hautes terres permet de supposer que les Glaces de Foxe ont couvert une vaste étendue avant la dernière glaciation. Les minéraux argileux dans le régolite et les champs de pierres sur les hautes terres témoignent d'un intervalle de météorisation subséquent, auquel a succédé une période d'activité périglaciaire. Au cours de la Glaciation de Foxe (Wisconsinien), les glaces couvrant les hautes terres sont entrées en coalescence pour former une calotte glaciaire locale (Glaces de Melville). Cette calotte glaciaire a par la suite été incorporée aux Glaces de Foxe, bien qu'une ligne de partage secondaire ait persisté dans la presqu'île, obstruant et déviant l'écoulement des Glaces de Foxe. Dans la calotte glaciaire, la présence de zones à base froide et de lignes de partage glaciaire locales a permis la conservation du régolite sur les plateaux. Certains secteurs de la calotte glaciaire sont progressivement devenus à base tempérée. La déglaciation a débuté avec la pénétration d'une indentation marine au sud de l'île Wales il y a environ 8 600 ans, au moment où s'écoulait un courant glaciaire à travers l'isthme Rae et que se formait la Moraine de Melville, aussi loin au sud qu'à la rivière Matheson. L'altitude des limites marines permet de supposer que la débâcle des Glaces de Foxe s'est fait rapidement mais progressivement il y a de 6 800 à 7 000 ans. Les glaces qui se sont maintenues dans la presqu'île se sont écoulées jusqu'au littoral selon une configuration radiale aussi tard qu'il y a 6 400 ans et, par la suite, se sont retirées progressivement à l'intérieur des terres. Des masses résiduelles de glace ont stagné à proximité de la baie Haviland et de la rivière Aua. D'abondantes formes créées sous les glaces et en bordure des glaces par les eaux de fonte rendent compte de manière caractéristique de la déglaciation.

Les signatures géochimiques des échantillons de till et de chapeaux de fer sont liées à la lithologie, aux directions et aux styles du transport glaciaire, ainsi qu'à la durée de l'altération météorique. Dans les secteurs régis par les glaces du bassin Foxe, les constituants du till témoignent d'un transport sur de grandes distances. À l'aplomb de la ligne de partage glaciaire de Melville, par ailleurs, la composition du till rend compte de la lithologie sous-jacente. Les rapports plomb/zinc dans le régolite, le till et les chapeaux de fer sont indicateurs d'une réactivité géochimique postglaciaire. Les chapeaux de fer auxquels sont associés des anomalies de Zn, Cd, Ni et Cu se rencontrent surtout dans les roches du Groupe de Prince Albert et aux contacts des schistes et des marbres dans le Groupe de Penrhyn.

SUMMARY

This report and accompanying maps present the results of fieldwork and airphoto geological mapping of the Quaternary geology and geomorphology of southern Melville Peninsula, an area of about 40 000 km^2. Fieldwork was completed by helicopter-supported ground traverses in 1990 and 1991. The report provides information on the nature and distribution of surface materials, and the geological history of a previously unmapped part of the Canadian Shield.

Southern Melville Peninsula lies on the eastern Arctic mainland on the west side of Foxe Basin. Archean granite, granite gneiss, and volcanic rocks, together with Aphebian paragneiss and marble of the Penrhyn Group of the Foxe fold belt, comprise upland areas. Eastern coastal lowlands and Wales Island contain Paleozoic limestone, as do some graben structures along Lyon Inlet–Hoppner Inlet. There are small ultramafic bodies on the uplands, and gossans are abundant. The large-scale landscape features have pre-Quaternary origins.

Quaternary glaciations and weathering intervals have created terrain consisting of weathered regolith and an immature blocky till, called 'regotill', derived from it; bouldery to pebbly granitic till having a silty sand matrix; calcareous silty till; calcareous glaciomarine deposits; raised marine features that include flights of limestone and granite boulder beaches and fine-grained blanket deposits that are sparsely fossiliferous; and bare, glaciated rock outcrop.

Striations, streamlined rock and till forms, and compositional variations in the till sheet have been mapped and used to reconstruct the glacial history of the peninsula. Scattered limestone boulders in upland block fields suggest that all of Melville Peninsula was covered by an early major warm-based ice sheet prior to the last glaciation. This ice sheet was centred in Foxe Basin. Clay minerals in regolith, large stony earth circles, and upland block fields indicate a long ensuing weathering interval, possibly of Sangamonian age, followed by a period of periglacial activity.

During the last glaciation (Foxe Glaciation=Wisconsin Glaciation), Melville Peninsula was covered by ice sheets that formed the western side of the Foxe–Baffin sector of

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Le présent rapport et les cartes qui l'accompagnent donnent un aperçu de la géologie et de la géomorphologie du Quaternaire du secteur méridional de la presqu'île Melville. La cartographie de ce vaste territoire, qui couvre une superficie d'environ 40 000 km^2, repose sur des travaux de terrain et sur l'interprétation de photos aériennes. Les travaux de terrain ont été effectués en 1990 et 1991 et ont consisté en parcours au sol avec déplacement par hélicoptère. Le présent document fournit des données sur la nature et la répartition des matériaux superficiels ainsi que sur l'histoire géologique d'une partie du Bouclier canadien n'ayant jamais fait l'objet d'une cartographie géologique.

Le secteur méridional de la presqu'île Melville se trouve à l'extrémité est de la partie continentale de l'Arctique et forme la bordure ouest du bassin Foxe. Les régions de hautes terres renferment des granites, des gneiss granitoïdes et des roches volcaniques de l'Archéen, ainsi que des unités aphébiennes de la zone de plissement de Foxe qui se composent de paragneiss et de marbre du Groupe de Penrhyn. Les basses terres côtières à l'est, l'île Wales, ainsi que certains grabens se trouvant dans l'axe de l'inlet Lyon et de l'inlet Hoppner renferment des calcaires du Paléozoïque. Dans les hautes terres, on peut observer de petites masses de roches ultramafiques et d'abondants chapeaux de fer. La structure à grande échelle du paysage est antérieure au Quaternaire.

Les glaciations et les intervalles d'altération du Quaternaire ont produit un terrain où on peut observer un régolite altéré ainsi qu'un till à blocs peu évolué dérivé de celui-ci, auquel on donne le nom de «régotill»; un till à blocs et à cailloux, à matrice de sable silteux, de source granitique; un till silteux de composition calcareuse; des dépôts glaciomarins de composition calcareuse; divers éléments marins aujourd'hui soulevés, dont des bandes de dépôts de plage à blocs de calcaire et de granite ainsi que des dépôts à grain fin légèrement fossilifères disposés en nappe; et des affleurements rocheux dénudés, anciennement englacés.

Les stries, les formes profilées des roches et du till ainsi que les variations de composition de la nappe de till ont été relevées et ont servi à la reconstitution de l'histoire glaciaire de la presqu'île. Des blocs de calcaire éparpillés dans les champs de pierres sur les hautes terres donnent à penser que la presqu'île Melville était entièrement recouverte d'une importante calotte glaciaire à base tempérée avant la dernière glaciation. Le centre de cette calotte glaciaire était situé dans le bassin Foxe. Les minéraux argileux dans le régolite, les vastes cercles de terre à pierres et les champs de pierres sur les hautes terres témoignent d'un long épisode subséquent de météorisation, vraisemblablement d'âge sangamonien, auquel a succédé une période d'activité périglaciaire.

Au cours de la dernière glaciation (la Glaciation de Foxe qui est équivalente à la Glaciation du Wisconsinien), la presqu'île Melville était recouverte de calottes glaciaires formant la bordure occidentale des

the Laurentide Ice Sheet. Ice initially accumulated on central and southeastern areas, and coalesced to form a local ice sheet (Melville Ice). With growth of a major ice dome in Foxe Basin, this ice sheet was later subsumed by Foxe Ice, although a subsidiary divide persisted on the peninsula, blocking ice flow from the main dome, and diverting it through Rae Isthmus, as shown by the distribution of calcareous till. The rate of attenuation of carbonate in the dispersal train suggests that ice streams, fed by converging Foxe, Melville, and Keewatin ice sheets, were flowing through Rae Isthmus. Ice governed by the subsidiary divide flowed over the rest of the peninsula, depositing a granitic till. Cold-based zones, or zones with minimal basal flow associated with the local ice divides, characterized ice flow on the central Melville plateau and on Hurd peninsula, preserving regolith. Cold-based zones beneath early ice divides in the southeast became warm-based during the course of glaciation, and are delimited by areas of regotill.

The deglaciation of southern Melville Peninsula began with the penetration of a marine re-entrant into areas south of Wales Island about 8600 years ago. Ice streaming through Rae Isthmus was then accelerated by calving at the ice front. The Melville Moraine formed along the west side of the peninsula as far south as Matheson River, as a glaciodynamic response to calving. Marine limits of 180 m in the south, becoming 140–150 m in the north, indicate a progressive but rapid breakup of the ice centred in Foxe Basin 6800–7000 years ago, and this event instigated the removal of Foxe Ice from Rae Isthmus and the southeast coast. Remaining ice on the peninsula began to flow radially towards the coasts. Dates from glaciomarine deltas indicate that Melville Ice still extended as far as the coasts as late as 6400 years ago, and gradually retreated inland. Ice was active for most of the time, although small remnants eventually stagnated north of Haviland Bay and in the Aua River area. Abundant subglacial and ice-marginal erosional meltwater features were created during deglaciation. The pattern of ice retreat is apparent from the location of sidehill channels on the east side of the uplands, and the elevations of ice-marginal lakes on the west. Downwasting exceeded backwasting over the western part of the central Melville plateau.

Modern processes and geotechnical properties of materials are summarized in 'Economic and environmental geology of Quaternary materials'. Periglacial processes are active in the present environment, leading to rock shattering, ice lensing in fine materials, and soil movement in mud boils and solifluction lobes. The permafrost in about 400 m thick. Active-layer depths range from about 10 cm on unvegetated uplands to more than 1 m in wet lowlands. Some large ice-wedge polygons on the central Melville

secteurs de Foxe et de Baffin de l'Inlandsis laurentidien. La glace s'est d'abord accumulée dans les régions du centre et du sud-est et, plus tard, les masses de glace sont entrées en coalescence pour former une calotte glaciaire d'étendue locale (Glaces de Melville). Avec la croissance d'un vaste dôme glaciaire dans le bassin Foxe, cette calotte glaciaire a été ultérieurement intégrée aux Glaces de Foxe, bien qu'une ligne de partage de glaciaire secondaire se soit maintenue dans la presqu'île, obstruant l'écoulement glaciaire en provenance du principal dôme glaciaire et le déviant à travers l'isthme Rae, comme en témoigne la répartition du till de composition calcareuse. Le taux de diminution de la concentration de fragments carbonatés dans la traînée de dispersion permet de penser que les courants de glace, alimentés par la convergence des calottes glaciaires de Foxe, de Melville et du Keewatin, s'écoulaient à travers l'isthme Rae. Les glaces régies par la ligne de partage glaciaire secondaire se déplaçaient sur le reste de la presqu'île, en déposant un till de source granitique. Des zones à base froide ou des zones à écoulement basal minimal associées aux lignes de partage glaciaire locales, caractérisaient l'écoulement glaciaire dans la partie centrale du plateau de Melville et dans la presqu'île Hurd, assurant de ce fait la conservation du régolite. Des zones à base froide situées à l'aplomb des premières lignes de partage glaciaire dans le sud-est sont devenues des zones à base tempérée au cours de la glaciation et sont délimitées par des zones de régotill.

La déglaciation du secteur méridional de la presqu'île Melville a débuté avec la pénétration d'une indentation marine dans les secteurs au sud de l'île Wales il y a environ 8 600 ans. Les courants glaciaires traversant l'isthme Rae ont alors pris de la vitesse en raison du vêlage au front glaciaire. La Moraine de Melville s'est formée le long de la côte occidentale de la presqu'île aussi loin au sud qu'à la rivière Matheson, en réaction glaciodynamique au vêlage. Les limites marines situées à une altitude de 180 m au sud et qui passent à 140-150 m au nord indiquent que la débâcle des glaces centrées sur le bassin Foxe s'est produite progressivement mais rapidement il y a de 6 800 à 7 000 ans. Ce phénomène a entraîné le retrait des Glaces de Foxe de l'isthme Rae et de la côte sud-est de la presqu'île Melville. Les glaces encore présentes dans la presqu'île ont commencé à s'écouler selon une configuration radiale vers le littoral. La datation des deltas glaciomarins indique que les Glaces de Melville continuaient de s'étendre jusqu'au littoral il y a encore 6 400 ans et se sont retirées par la suite progressivement vers l'intérieur des terres. Les glaces sont demeurées mobiles la plupart du temps, bien que de petites masses résiduelles de glace se soient immobilisées par la suite au nord de la baie Haviland et dans le secteur de la rivière Aua. D'abondantes structures d'érosion ont été créées pendant la déglaciation par les eaux de fonte sous les masses de glace et à leurs bordures. La configuration du retrait glaciaire est bien révélée par les chenaux formés à flanc de coteau sur le versant oriental des hautes terres, ainsi que par l'altitude des limites des lacs proglaciaires à l'ouest. La fonte sur place des masses de glace constituait un phénomène plus important que le retrait glaciaire dans le secteur ouest du plateau de Melville central.

Les processus actuels affectant les matériaux et leurs propriétés géotechniques sont présentés brièvement dans la section «Economic and environmental geology of Quaternary materials». Des processus périglaciaires ont cours dans l'environnement actuel, provoquant la fragmentation des roches, la formation de lentilles de glace dans les matériaux fins et le mouvement des sols dans les ostioles et les lobes de solifluxion. Le pergélisol a une épaisseur d'environ 400 m. La couche active atteint une profondeur de quelque 10 cm sur les hautes terres dépourvues de végétation et jusqu'à 1 m dans les basses terres

plateau may be relict features. Chemical weathering of limestone and marble has occurred in both ancient and modern times.

Five hundred and sixty till and gossan samples were collected for geochemical analyses. Data are listed in the appendices of this report, whereas distributions of selected elements are shown as page figures. Geochemical patterns are related to rock lithology, directions and styles of glacial transport, and length of time available for weathering. Samples that lie beneath former local ice divides or caps reflect the composition of underlying rock types, whereas the material in other areas affected by the Melville ice divide has been transported short distances; tills within areas controlled by Foxe Basin ice have undergone long-distance transport. Lead/zinc ratios in regolith, till, and gossans indicate the degree of geochemical reactivity in postglacial times. Gossans are preferentially found in either rocks of the Prince Albert Group, or schist-marble contacts in the Penrhyn Group. Many gossans shown here do not appear on previous maps. Although some geologists examining large gossans have concluded that rocks on southern Melville Peninsula have been totally leached of elements of economic interest, results in this report indicate that areas adjacent to the large gossans, as well as fresh till and small gossans, still maintain high concentrations of Zn, Cd, Ni, Cu, and other metals. Multiple-element anomalies are located and discussed. The most reliable geochemical interpretations come from the study of paired till and gossan samples.

humides. De grandes fentes de glace présentes dans le plateau de Me ville central sont sans doute des structures reliques. La météorisatio chimique du calcaire et du marbre s'est produite à la fois au cours de temps actuels et anciens.

On a prélevé cinq cent soixante échantillons de till et de chapeau d fer pour en faire l'analyse géochimique. Les données sont présentée en annexe et la répartition d'éléments choisis est illustrée dans des fig ures. Les configurations géochimiques sont liées à la lithologie, au directions et aux styles du transport glaciaire, ainsi qu'à la durée de l météorisation. Les échantillons prélevés à l'aplomb des ancienne lignes de partage glaciaire et calottes glaciaires d'étendue local traduisent la composition de la lithologie sous-jacente, alors que le matériaux présents dans les autres secteurs régis par la ligne de partag glaciaire de Melville ont été transportés sur de courtes distances. Le ti contenu dans les régions régies par les glaces du bassin Fox témoigne, pour sa part, d'un transport sur de grandes distances. Le rapports plomb/zinc dans le régolite, le till et les chapeaux de fe indiquent le degré de réactivité géochimique au cours de la period postglaciaire. On rencontre les chapeaux de fer surtout dans les roche du Groupe de Prince Albert ou aux contacts des schistes et des marbre dans le Groupe de Penrhyn. De nombreux chapeaux de fer relevé dans la présente étude ne figurent par sur les anciennes cartes. Bie que selon certains géologues ayant fait un examen des grand chapeaux de fer, les roches situées dans le secteur méridional de l presqu'île Melville ont été entièrement lessivées de leurs élément d'intérêt économique, les résultats exposés dans le présent rappor révèlent que les zones adjacentes aux grands chapeaux de fer, ainsi qu le till non altéré et les petits chapeaux de fer renferment encore d fortes concentrations de Zn, Cd, Ni, Cu et d'autres métaux. Des anom alies à éléments multiples ont été localisées et étudiées L'interprétation géochimique la plus sûre est tirée de l'étud d'échantillons combinés de till et de chapeaux de fer.

INTRODUCTION

Southern Melville Peninsula project

Report structure

This report and accompanying maps 1847–1851A (in pocket) result from an investigation of the Quaternary geology and geomorphology of the south half of Melville Peninsula, Nunavut, an area of about 40 000 km^2 (Fig. 1). Maps 1847A–1851A were printed before the new territory of Nunavut was established, therefore the names "District of Keewatin", "District of Franklin", and "Northwest Territories" can still be found on the maps, but have been updated for this bulletin. Prior to this project, information on the Quaternary geology of the area was based primarily on isolated observations made near the coast. Therefore, the purpose of the southern Melville Peninsula project was to map the area systematically in order to determine the distribution character, and origin of surface materials, and to reconstruct the Quaternary geological history of the area. The study also addresses issues relevant to land management, environmental studies, engineering, and mineral exploration. It complements GSC Memoir 484 (Dredge, 1995a), which concerned northern Melville Peninsula.

The first part of the bulletin provides background information relevant to an understanding of the Quaternary and surficial geology of the area. It puts the present project into context with previous fieldwork. The first section also describes bedrock elements affecting Quaternary geology. The following section discusses the nature and origin of the main physiographic elements forming the landscape.

The section on the nature and distribution of surficial materials includes their physical properties and landforms, along with data on texture and composition, and offers an interpretation on their mode of formation. Maps 1847A–1851A portray 16 genetic classes of surficial materials, and accompany this section. These data form the basis for the interpretation of Quaternary history of the region, the section dealing with glaciation and deglaciation, and sea-level changes.

The section on present geomorphic processes addresses topics of particular interest to environmental concerns and land management. The final section emphasizes those elements of the project that concern mineral exploration, specifically till provenance, directions and distances of glacial transport, concentrations of elements in till, and their relationship to bedrock geology. A report on till geochemistry (Dredge, 1995b) has already been published separately; therefore, geochemical data are only presented here in summary form.

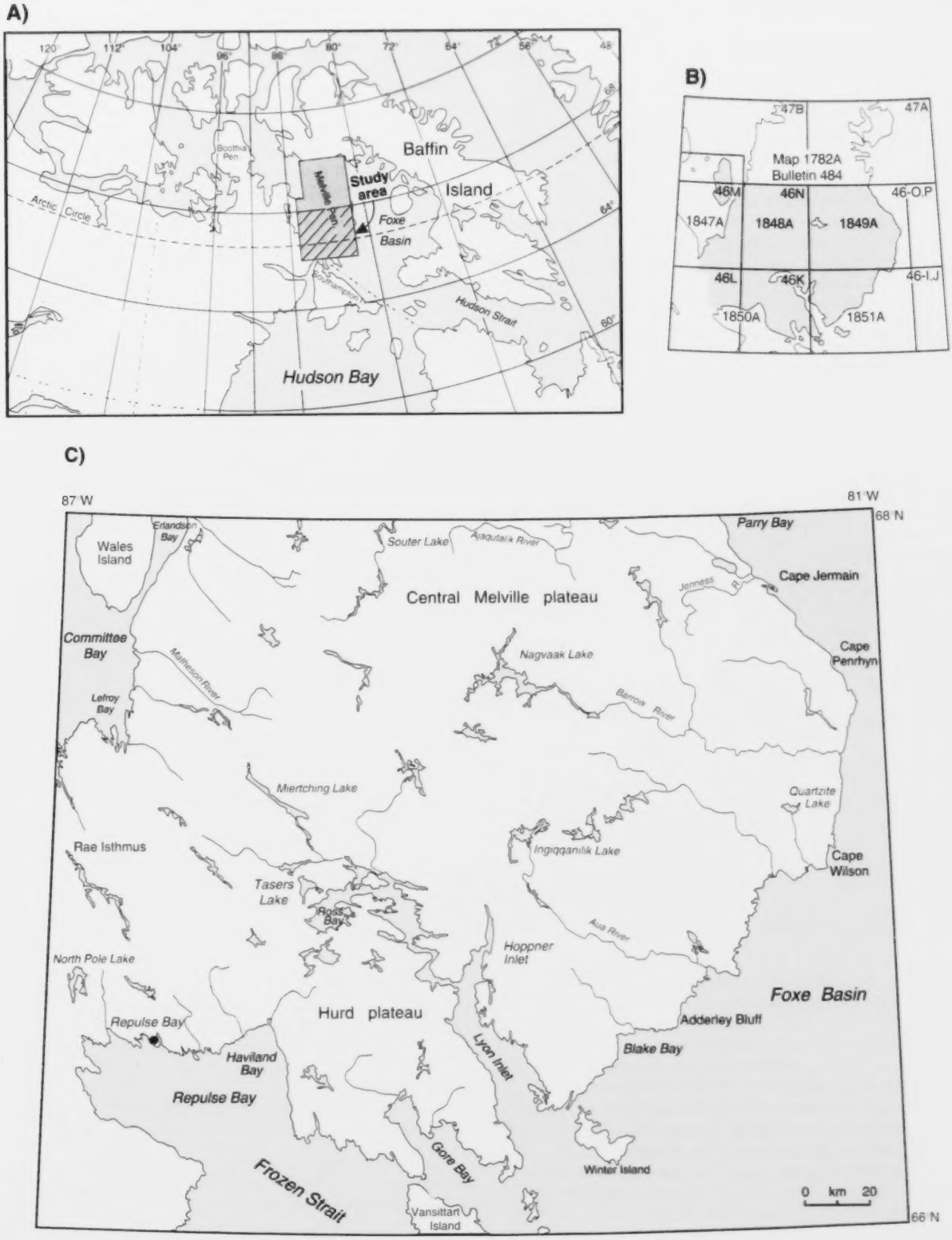


Figure 1. *Map area and names used in this report.* ***A)****,* ***B)*** *index maps;* ***C)*** *southern Melville Peninsula.*

Fieldwork

Fieldwork was conducted in 1990 and 1991. Systematic mapping was completed using airphoto interpretation and detailed ground traversing with helicopter support. Quaternary deposits were examined at more than 1100 sites and sampled at about 560 sites. Terrain conditions and textural and compositional characteristics of till and other materials were observed, striations were measured, and other ice-flow indicators were noted. The samples were analyzed later for grain size, carbonate content, lithology, element concentrations, and basic engineering properties. Elevations were measured with a Wallace and Tiernan™ surveying altimeter, using high tide as the reference datum. The precision interval was 2 m. New topographic maps with a 10 m contour interval are available for parts of the area, and were also used to determine the elevation of features identified on aerial photographs. Manuscript geological maps were compiled at a scale of 1:50 000 for Winter Island (NTS 46-I, J), Hurd Channel (NTS 46 M), Repulse Bay (NTS 46 L), Lefroy Bay (NTS 46 M), Miertsching Lake (NTS 46 N), and Barrow River (NTS 46-O, P) map sheets, and reduced to a scale of 1:200 000 for presentation as maps 1847A–1851A, which accompany this report.

Acknowledgments

Helicopter and fixed-wing support was generously provided by Polar Continental Shelf Project. Maurice Coyle, Paul Mikyungiak, and Dawn Russell were the field assistants on this project. Art Dyke critically read the manuscript, and helped clarify many of the ideas in this report.

Previous fieldwork on Quaternary geology

By the end of the nineteenth century, the coastline of southern Melville Peninsula had been mapped. In 1821 and 1823 Captain W.E. Parry and G.F. Lyon surveyed the south and east coastlines between Repulse Bay and Cape Jermain (Parry Bay) (Lyon, 1824; Parry, 1824). J. Rae of the Hudson's Bay Company travelled across Rae Isthmus in 1846 and mapped the west coast and Wales Island, naming most of the rivers and capes there. In 1867 C.F. Hall completed the exploration of the east side of Committee Bay (Nourse, 1879).

The first comments on the physiography of the area were published by Tremblay (1921), based on an exploratory geology survey in 1912–1913 between the north coast of Melville Peninsula and Parry Bay on the east coast. The Danish 5th Thule expedition provided more information on the physical geography and geology of the southern and eastern coastal areas. A report by Mathiassen (1933) included a description of some major landforms, rock types, striations, and raised marine shorelines, whereas his colleague Laursen (1946) described postglacial fossils at some localities. Mathiassen (1933) concluded that glacial ice flow was southeastward and eastward at most localities visited, but southward across Rae Isthmus, and that postglacial seas reached elevations of about 55 m at Repulse Bay and 170 m near Gore Bay.

Craig (1965a) provided brief comments on surficial geology as part of a bedrock mapping project (Operation Wager). Craig (1965b), Falconer et al. (1965a, b), and Blake (1966) interpreted the moraine that runs along the west coast of the peninsula as part of an eastern Arctic group of deglacial features called the 'Cockburn Moraine System'. Craig also provided the first radiocarbon dates on postglacial marine shells in the region, and determined that deglaciation occurred about 6900 years ago.

The main study of the physical geography and glacial history of the area was conducted by V.W. Sim. In 1957–1959 Sim ran several dog-team traverses along the entire east and west coasts, and inland between Repulse Bay and Haviland Bay. From fieldwork, combined with airphoto interpretation, he produced a Ph.D. thesis (Sim, 1962) and comprehensive Geographical Branch report and map (V.W. Sim, unpub. manuscript, 1961). His report, and related papers on sea-level change (Sim, 1960a), the west coast moraine and deglaciation (Sim, 1960b), and ice-flow patterns (Sim, 1960b) remained the principal works on the physiographic development, Quaternary geology, and geomorphic processes of southern Melville Peninsula until the undertaking of the present project.

Terms such as 'Laurentide Ice', 'Foxe Ice', and 'Baffin Ice' have been used inconsistently in the past to describe ice cover on Melville Peninsula. The term 'Melville Ice' is used in this report to refer to ice which accumulated on Melville Peninsula, whereas the term 'Foxe Ice' is used to refer to glacier ice flowing from an ice dispersal centre in Foxe Basin. Foxe Ice, Melville Ice, together with Baffin Ice (ice from a divide on Baffin Island), form the geographic 'Foxe–Baffin sector' of the Laurentide Ice Sheet.

Bedrock geology

Precambrian rocks

Bedrock mapping began in 1964 as Operation Wager, resulting in the publication of a regional map at 1:506 880 scale (Heywood, 1967). Melville Peninsula consists of Precambrian basement rocks of the Churchill structural province, flanked by Paleozoic sedimentary rocks (Schau, 1984, 1993) (Fig. 2). Most of the rock is granitoid gneiss, paragneiss, schist, and granite.

The oldest rocks, the Prince Albert Group (Heywood, 1967; Frisch, 1982), are known primarily in the northwest part of the study area, and are Archean. They are metavolcanic and metasedimentary rocks, chiefly paragneiss. Banded magnetite–quartz–iron-formation is a distinctive rock within this group, as are ultramafic lavas and amphibolite. Glacial erratics of iron-formation in the central and southern parts of the area suggest that the Prince Albert Group may be more widespread than existing maps portray.

Granitoid gneiss and schist of various compositions intrude the Prince Albert Group and are the most common rocks in the region. The younger Penrhyn Group is Aphebian and forms prominent northeast-trending synclines and anticlines in the central part of the area. This group consists of metasedimentary rocks, chiefly paragneiss, but includes

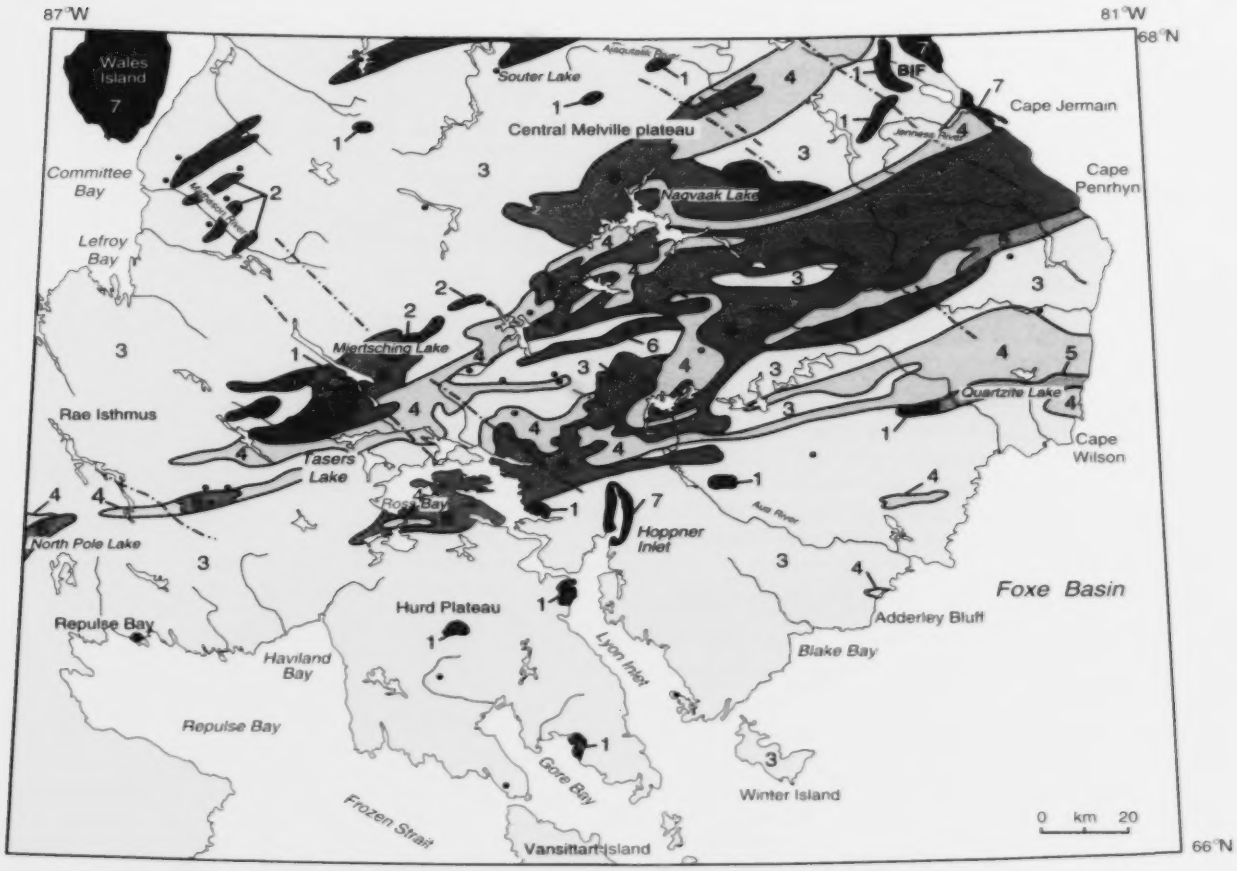
schist, amphibolite, quartzite, and marble (Reesor et al., 1975; Okulitch et al., 1977, 1978; Henderson, 1983, 1988). Ultramafic bodies associated with this group seem to be confined to areas around Ross Bay. The Penrhyn Group rocks have been complexly folded and metamorphosed to amphibolite facies during the Hudsonian Orogeny. Granite plutons, intruded late in the orogeny, are small bodies with high levels of uranium (Maurice, 1979; Henderson, 1983). Resistant, northwest-trending diabase dykes up to 30 m wide and 10 km long crosscut older rocks (Fahrig and Jones, 1969; Fahrig et al., 1971).

Paleozoic rocks

Flat-lying, Ordovician carbonate rocks occupy downdropped fault blocks that flank the peninsula. Wales Island is composed of limestone and dolomite. Other outcrops are limited to the east coast north of Cape Jermain, and four sites in a small graben along Hoppner Inlet (Trettin, 1975; Bolton et al., 1977).

Relation to glaciation

A close relationship exists between bedrock type, landforms, glacial ice-flow patterns, and erosion. For example, marble and graphite belts are most susceptible to chemical



Paleozoic
- 7 Limestone, dolomite

Proterozoic
- Diabase, gabbro dykes
- PENRHYN GROUP
  - 6 Paragneiss
  - 5 Quartzite
  - Marble

Archean
- 3 Granite, granitoid gneiss
- PRINCE ALBERT GROUP
  - BIF Banded iron-formation
  - 2 Metasedimentary rocks
  - 1 Undifferentiated basic volcanic rocks and peridotite
- Gossans

Figure 2. *Bedrock geology* (modified from *Heywood, 1967; Frisch, 1982; Henderson, 1983*).

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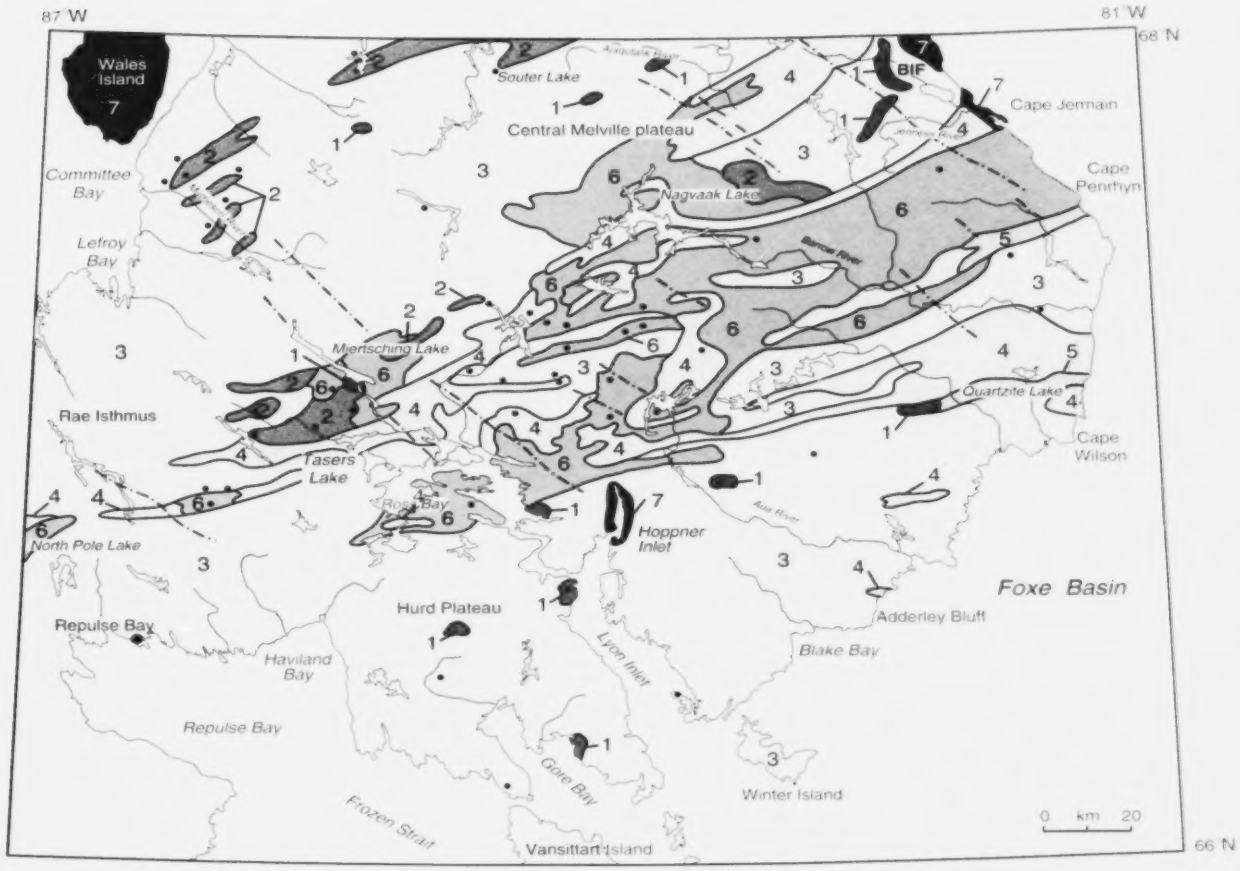

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weathering and glacial erosion, and tend to form valleys, whereas adjacent bands of paragneiss are ridge-formers. Along the west coast, deep glacial erosion is prevalent along fault zones, where rock has been chemically altered and weakened. Rock drumlins and intermediate-sized streamlined bedforms are commonly associated with foliated rocks north of Repulse Bay, where gneiss units of different strengths are juxtaposed.

Rock type also determines the texture of tills, with granitic and gneissic rocks generating sandy till, and marble and limestone forming siltier tills. The lithology and texture of tills in turn affect the permeability, deformability, and ice-flow conditions during glaciation and the postglacial behaviour of these sediments.

The Paleozoic carbonate rocks, along with quartzite, marble, and banded iron-formation, are the principal distinctive rock types used for determining drift dispersal and reconstructing ice-flow directions. The distribution of ultramafic rocks is not sufficiently well known to be of use.

PHYSIOGRAPHY

Landscape evolution

Melville Peninsula forms a north-trending horst the sides of which drop along straight-segmented fault-line scarps to grabens forming the lowlands of Committee Bay and Foxe Basin. Lyon Inlet is also part of a graben.

Tilting of the Melville Arch horst structure down towards the east began in the mid-Proterozoic, after emplacement of the basement rocks and early supracrustal successions (Schau, 1984), and continued through the Hudsonian Orogeny. The land was eroded enough to expose deep-crustal granulite rocks in the north and west, and weathered enough to produce regoliths that are preserved at the base of the Penrhyn Group and below Proterozoic metasediments near Folster Lake (68°N, 86°W; Frisch, 1982). Mass loss due to erosion probably contributed to continuing uplift. By late Precambrian, a tilted peneplain probably had developed (Fig. 3A; Sim, 1962).

During the early Paleozoic, transgressions and regressions associated with the opening and closing of the proto-Atlantic ocean, together with warping of the crust, resulted in several periods of deposition of marine sediments over the entire Precambrian surface (Fig. 3B), separated by intervals of erosion (Bolton et al., 1977, p. 7–21). Erosional events are inferred from unconformities, terrigenous clastic beds, and weathering zones in Paleozoic rock (Fig. 3C). Faulting and uplift of the main horst occurred in the mid-Devonian (Fig. 3D), and uplift may have recurred during raising of the Boothia and Bell arches in the Mesozoic and Tertiary (Fortier and Morley, 1956). The uplift of surfaces probably proceeded intermittently during various regional tectonic events, as indicated by rock benches and broken longitudinal topographic profiles (Fig. 4; Bird, 1967).

The landscape of southern Melville Peninsula is part of one or more old erosion surfaces that were exhumed after the Ordovician cover rocks were stripped off. Because the

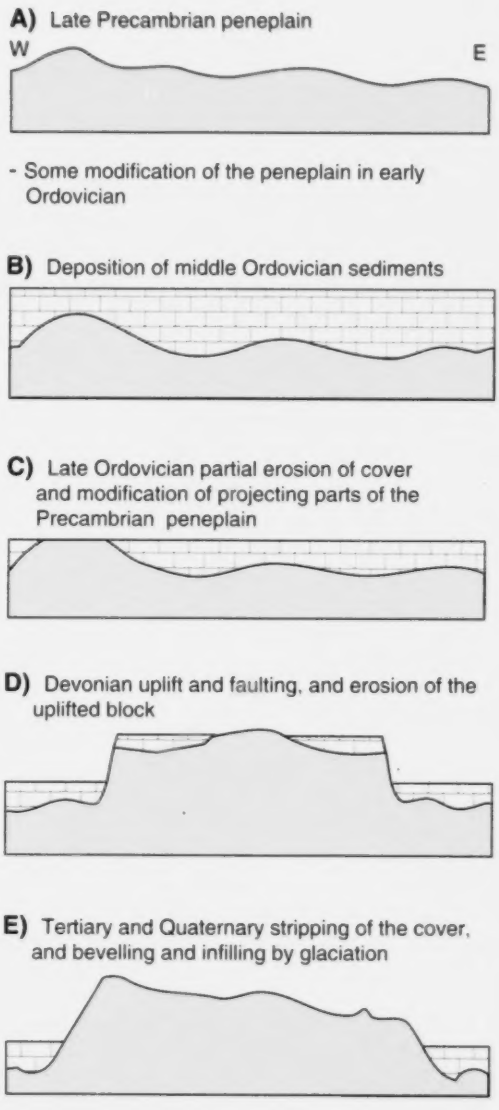

A) Late Precambrian peneplain
W
E
- Some modification of the peneplain in early Ordovician
B) Deposition of middle Ordovician sediments
C) Late Ordovician partial erosion of cover and modification of projecting parts of the Precambrian peneplain
D) Devonian uplift and faulting, and erosion of the uplifted block
E) Tertiary and Quaternary stripping of the cover, and bevelling and infilling by glaciation

Figure 3. A)–E) *Physiographic evolution of Melville Peninsula* (after *Sim, 1962*).

surfaces cut across rocks of different types and ages, they are considered to be peneplains, not structural features. The highest surface occupies the central and northern parts of the area, and is characterized by a rolling upland, containing several broad valleys now occupied by Souter Lake and Ajaqutalik River. The surface slopes to the east from 450 m to about 300 m east of 83°W (Fig. 4, profile A-B). On the west side it is dissected by short, entrenched streams and terminates at the Prince Albert Hills. The peninsula west of Lyon Inlet forms a tilted plateau (the Hurd plateau) with summit elevations averaging 330 m (Fig. 4, profile E-F). The sides are fault-line scarps that drop into Haviland Bay and Lyon Inlet, but a

continuation of the plateau surface lies east of Lyon Inlet. The central Melville plateau and the Hurd plateau may both be parts of the same sloped surface, or different ones. These upland surfaces could be part of the Barrow Surface exposed on Boothia Peninsula, Somerset Island, and Baffin Island, but Bird (1967, Chapter 6) considered that they could equally be part of a younger peneplain which he called the "Central Arctic Surface".

These peneplains are of an unknown age, but are generally considered to manifest a Precambrian surface that had been substantially modified by post-Devonian events, because they cut across Paleozoic rock types in other areas (e.g. Somerset Island: Bird, 1967; Dyke, 1983). The Hurd plateau surface, however, is pre-mid-Devonian, because it predates the formation of the Lyon Inlet graben.

Lower surfaces form extensive drift-covered benches of low relief that are 5–40 km wide in the Quartzite Lake, Aua River, and Rae Isthmus areas (Fig. 4, profile C-D). They rise from sea level to about 180 m a.s.l. in the Quartzite Lake–Aua River area, and to about 100 m a.s.l. on Rae Isthmus. Bird (1967) considered that these exhumed surfaces were uplifted and stripped of their Paleozoic cover much more recently than the higher surfaces, probably during the Tertiary. These landforms are therefore manifestations of exhumed, relatively unmodified Precambrian peneplains, rather than the more modified, longer exposed, higher upper surfaces. A few hills on the highest plateau surface rise to more than 500 m a.s.l. These also may be monadnock remnants of the oldest surface.

Quaternary glaciations ornamented the pre-existing landscape. Areas beneath parts of the last ice sheet experienced little erosion, so that some preglacial landforms, modified slightly by glacial meltwater, are preserved in those areas. Where ice flow was vigorous, glaciers modified the landscape by selective erosion of relatively soft bedrock or regolith, and by deposition of glacial debris. Further changes to the landscape have occurred in postglacial time due to glacio-isostatic rebound and related reactivation of some of the faults along the Bell Arch due to ice loading (Basham et al., 1977; Dredge, 1991). Recent cold-temperature processes continue to modify the preglacial and glacial landscape.

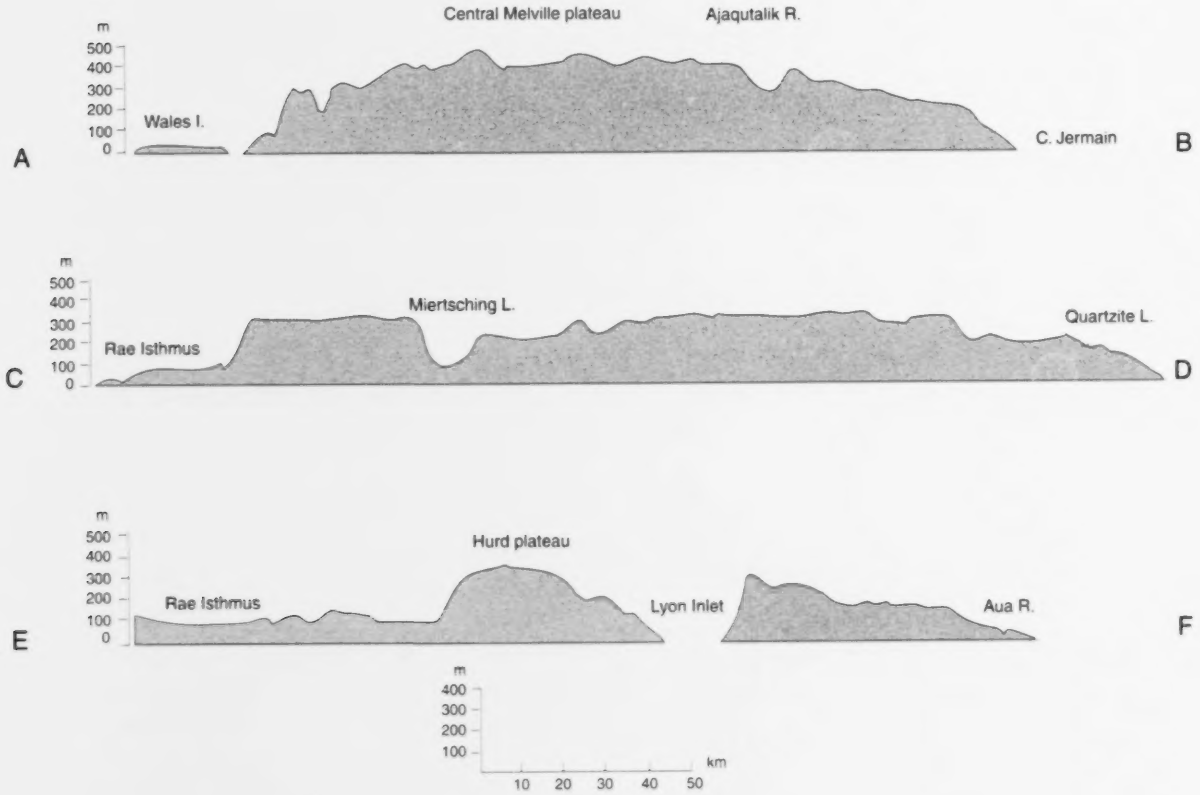
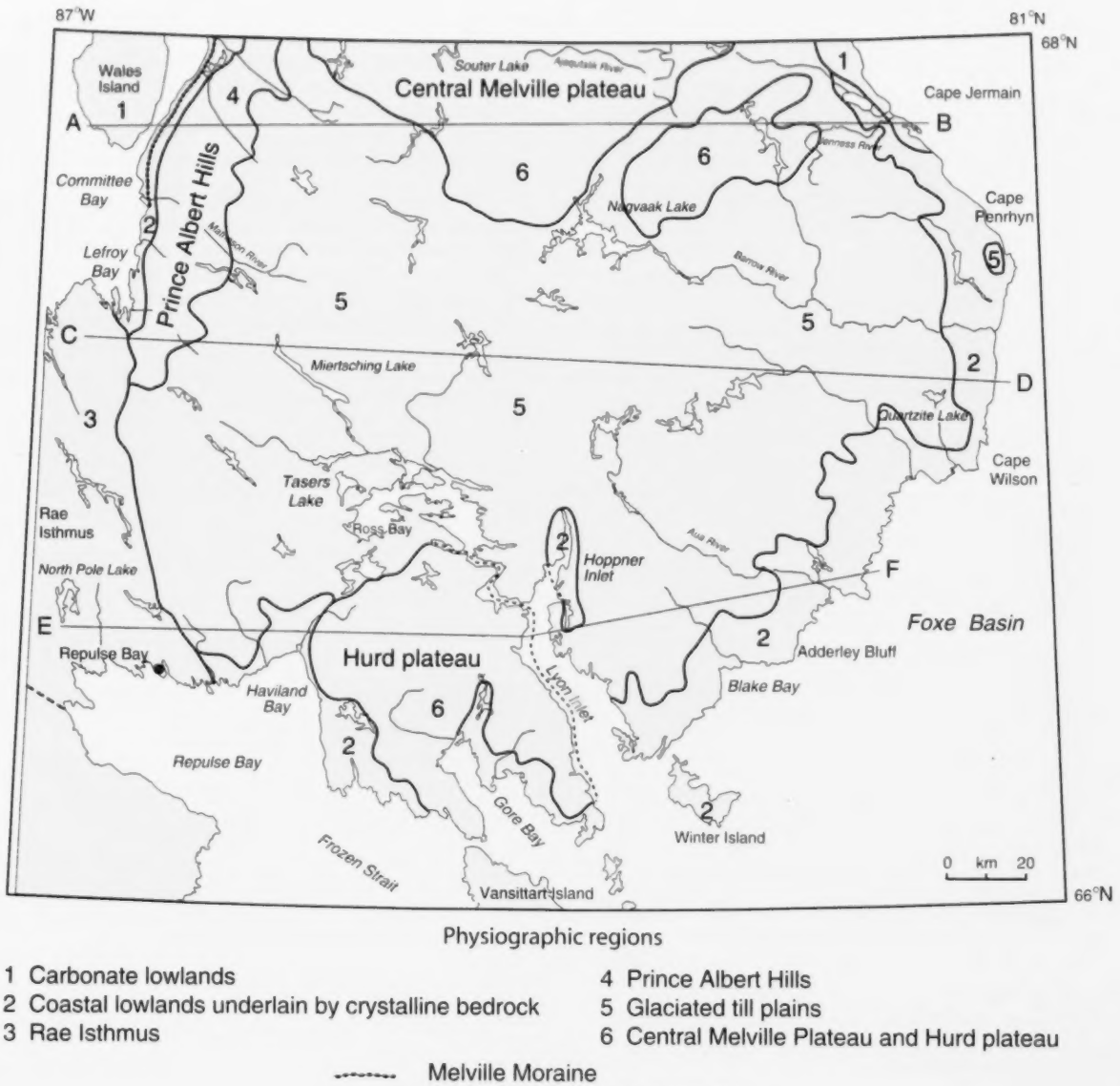


Figure 4. *Topographic profiles. Profile locations are shown on Figure 5.*



Physiographic regions

1 Carbonate lowlands
2 Coastal lowlands underlain by crystalline bedrock
3 Rae Isthmus
4 Prince Albert Hills
5 Glaciated till plains
6 Central Melville Plateau and Hurd plateau

Melville Moraine
A — B Location of topographic profiles

Figure 5. *Physiographic regions.*

Physiographic regions

Melville Peninsula can be divided into physiographic regions on the basis of topography and surface materials (Fig. 5).

Carbonate lowlands

All of Wales Island and a narrow coastal band north of Cape Jermain on the east side of the peninsula are underlain by Paleozoic limestone, forming lowlands between sea level and about 60 m a.s.l. The main topographic features are raised beaches commonly underlain by stepped limestone and bedrock buttes. The raised strands form closely spaced, unvegetated, gravelly berms. Grassy swales between ridges are poorly drained and are occupied by shallow lakes whose outlines change throughout the season and from year to year. The buttes are small, having cliffed sides less than 10 m high, the lower slopes of which are covered with scree.

At Cape Jermain, the lowland is bounded by a normal fault along which the Precambrian rocks have been uplifted (Bolton et al., 1977). The fault scarp is 150 m high.

Figure 6. *Stereopair of Matheson River area, showing bare, glaciated rock of the Prince Albert Hills and coastal lowlands with raised beaches (dashed lines) adjacent to Committee Bay. A series of outwash terraces (T) and deltas (D) formed where proglacial meltwaters, flowing in glacial troughs, debouched into a regressing postglacial sea. Dotted line marks the trace of the Melville Moraine. NAPL 15411-22, 15411-23.*

Coastal lowlands in areas of crystalline bedrock

Lowland terrain below 120 m a.s.l. lies along the east coast south of Cape Penrhyn, along Frozen Strait and Haviland Bay in the south, and along the west coast. These range from bands less than 2 km wide to plains up to 20 km wide. Wet meadows on sand, silt, and till are interrupted by bare rock ridges or knobby hills, and sets of raised beaches. Along the west coast, a broad ridge up to 10 m high, capped by sand and gravel, is the wave-washed remnant of an end moraine. The lowlands project into the Jenness, Barrow, and Matheson river valleys in a series of stepped deltas (Fig. 6).

Rae Isthmus

A lowland about 30 km wide extends for 70 km between Repulse Bay and Committee Bay. Much of the land lies below 100 m. The isthmus is an area of streamlined till and

rock forms (Fig. 7), and raised marine deposits. The well vegetated heath and grassy meadows are prime habitat for caribou and other mammals.

Prince Albert Hills

The Prince Albert Hills rise from Committee Bay to an average elevation of 450 m, but have internal relief of 150 m. These are bare, rocky, glaciated hills with accordant summits (Fig. 6); the hills are transected by deep glacial troughs (Fig. 8), many of which are partly filled with outwash. The hills are the highest part of a tilted peneplain, and they form the regional watershed.

Glaciated till plains

Most of the central part of the area forms a gently rolling landscape of glacial erosion and deposition. The terrain ranges in elevation from 150 m to 400 m, but local relief seldom exceeds 30–60 m. This region is covered by drumlin fields, rolling drift plains, and rocky uplands (Fig. 9). The terrain has a glacial grain and there are zones of intense streamlining of rock; one such zone extends northwestwards from Miertsching Lake. Rock structure has a significant effect on terrain in the eastern half of the peninsula (Fig. 10). Ridges of gneiss trending northeast form the sides of valleys that are underlain by marble.

Central Melville plateau and Hurd plateau

The central Melville plateau is an extensive upland ranging in elevation from about 500 m in the west to 350 m in the east; a plateau outlier near Barrow River descends to 300 m. The Hurd plateau declines from about 400 m in the west to 250 m in the east. On both, vegetation is sparse, and snowfields persist until late summer. The terrain is a mature, uniform, relatively featureless plain with low hills. There are few lakes and streams, except for the Ajaqutalik River in the north, which flows in a broad preglacial valley. Block fields and areas of gruss are extensive, although most of the region is mantled by

Figure 7.

Low drumlins with mud boiled grassy surfaces, and streamlined rock forms, station 2286, Rae Isthmus. Photograph by L.A. Dredge. GSC 1997-043MM

Figure 8.

Knobby, glacially scoured uplands, and a glacial trough with scree-covered lower slopes, Prince Albert Hills. Photograph by L.A. Dredge. GSC 1997-043B

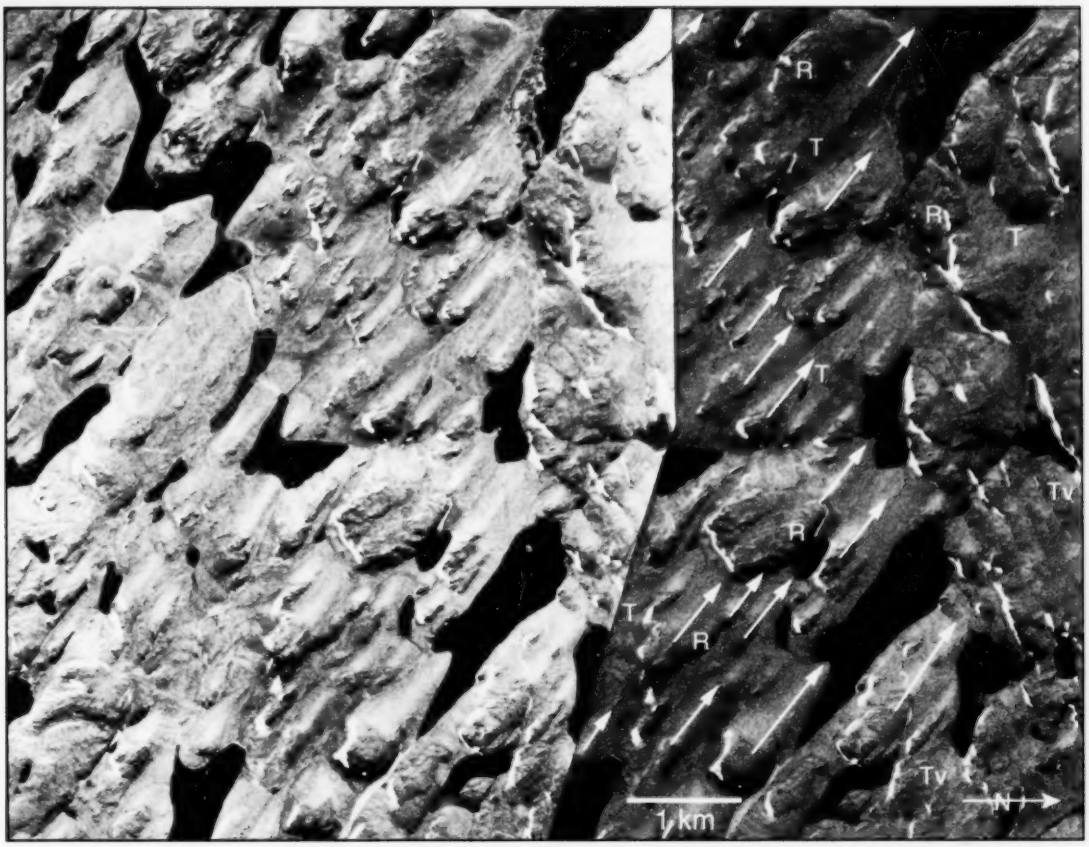


Figure 9. *Stereopair showing rock (R), till veneer (Tv), till blanket (T) and crag-and-tail forms (arrows) west of Miertsching Lake. NAPL 15353-23, 15353-24*

Figure 10.

Till and rock in marble terrain north of Lyon Inlet. Photograph by L.A. Dredge. GSC 1997-043H

a thin bouldery till (Fig. 11). The main glacial features were created by meltwater. They include flights of shallow side-hill meltwater channels along the Ajaqutalik River valley, and nearby channels which are deeply incised into bedrock (Fig. 12).

SURFICIAL MATERIALS AND LANDFORMS

Surficial materials and landforms were identified by airphoto interpretation and ground observations supplemented by textural and petrographic laboratory analyses. Maps 1847A–1851A and the generalized map (Fig. 13) show the distribution of glaciated rock units and Quaternary materials: broken rock, till, and sediments of glaciofluvial, glaciolacustrine, glaciomarine and marine, and alluvial origin. Tills are subdivided according to physical characteristics, landforms, and composition, whereas marine and/or glaciomarine deposits are subdivided by facies and surface form. Many ice-contact and proglacial deposits are too small to be portrayed as units on the final 1:200 000 scale maps; these units are designated by symbols. The distribution, physical nature, and topographic form of the materials are described in this section, and where appropriate, the mode of origin or geological significance is discussed. The appendices present data on texture, carbonate content, pebble lithology, and element geochemistry of the clay fraction.

On the accompanying maps, till units 2–6 are associated with ice originating on Melville Peninsula, whereas unit 10 was deposited by ice from the main Foxe Ice divide. Units 2 and 3 are rubbly deposits, and are termed 'regotill' because they resemble slightly modified regolith. Units 4, 5, and 6 are considered to be 'regular till'. Units 4 and 5 are primarily basal till, whereas unit 6 is a late glacial ablation till facies.

Glaciated bedrock outcrop (unit A)

The ages and types of bedrock found in the area are described in the 'Bedrock geology' section. On the maps accompanying this report, two types of outcrop have been delineated: Archean granite and granitic gneiss; and Aphebian marble, pelitic gneiss, schist, and quartzite. Fresh Paleozoic outcrop is limited to cliff faces on Wales Island, the lower parts of which are buried in scree, and to small cliffs along Lyon Inlet. These are not shown as map units. Coherent rock outcrop covers 21% of the terrain (8400 km^2). Much of this area has a distinct glacial grain, marked by numerous lakes with angular outlines determined by rock structure, and by glacially etched fracture patterns.

Major areas of glaciated outcrop include a belt of granite in the Prince Albert Hills directly east of the Melville Moraine (Fig. 6) and adjacent areas inland from Committee Bay. Glaciated outcrop is also common in granite and gneissic areas north of Repulse Bay, west of Gore Bay and along Lyon Inlet, and in belts of schistose and marble terrain north of Ross Bay. Small units of glaciated outcrop in other parts of the map area are associated with units of till veneer.

Bare rock is also present where glacial deposits have been eroded by waves and meltwater. Zones of bare rock lie on the south and southeast sides of the peninsula directly below the limit of postglacial marine submergence. Also, belts of washed rock, up to 25 km long and 1 km wide, lie along major subglacial meltwater conduits on the northeastern part of the peninsula (Map 1849A). On the central Melville and Hurd plateaus, outcrop is scarce and rough-surfaced; exposure is limited to small areas where glacial meltwater scoured away the regolith.

Several types of glacial rockforms have been created, varying from striae and grooves, through streamlined rock forms (Fig. 14), to glacial troughs. The granitoid rocks east of the Melville Moraine are highly polished and striated. Till is absent in these areas, and only a skift of erratic boulders litters

Figure 11.

Boulder fields on the graded surface of the Hurd plateau, station 2529. Background shows glaciated hills near Ross Bay. Photograph by L.A. Dredge. GSC 1997-043LL

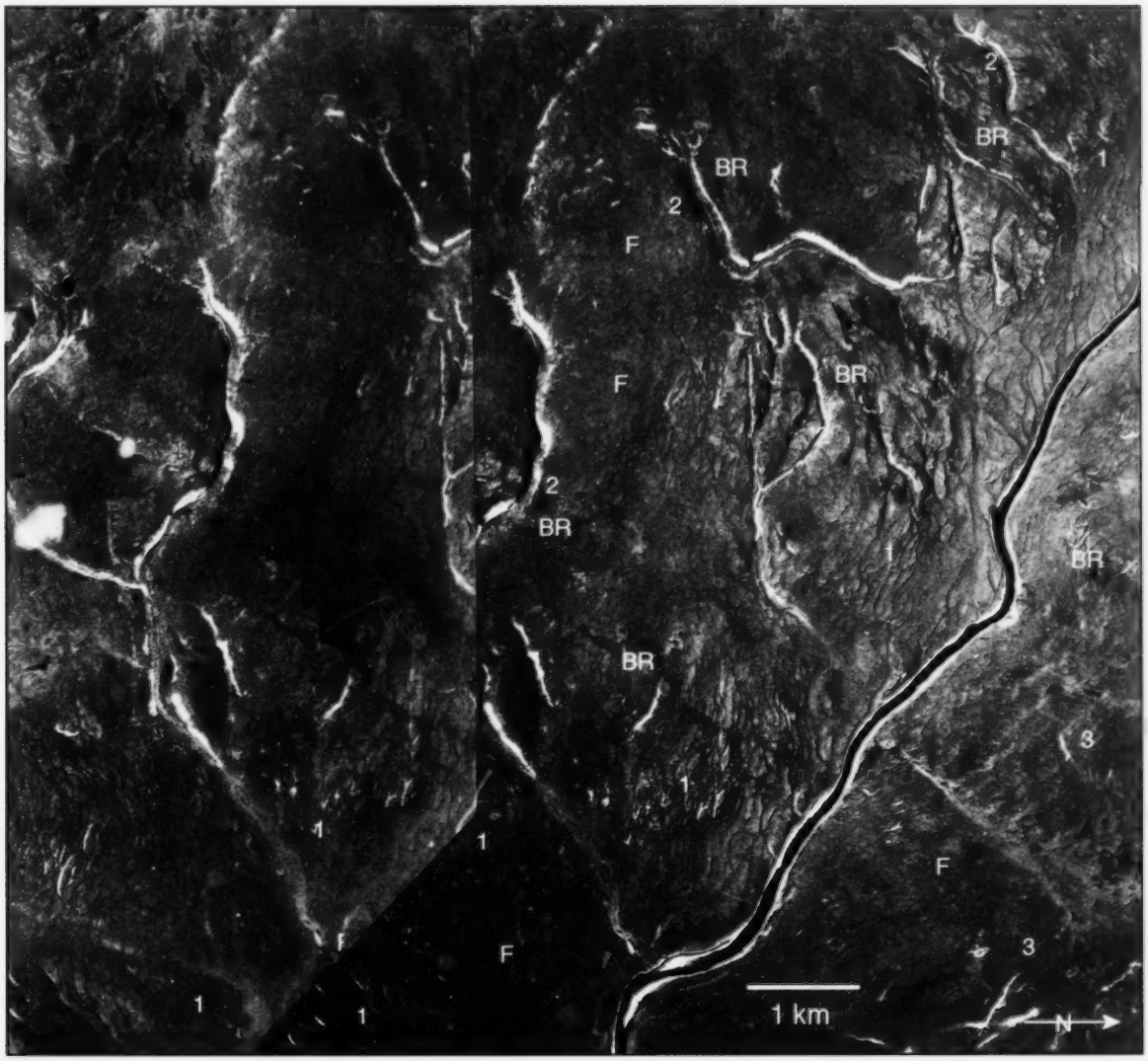


Figure 12. *Stereopair of the central Melville plateau near Ajaqutalik River consisting of broken rock (BR), regotill (F), and glacial meltwater features (including sets of lateral meltwater channels (1), deep rock-cut channels (2), and small, disconnected, subglacial meltwater features (3). NAPL 15736-88, 15736-89*

the surface. Areas of gneissic rock that are above marine limit are generally striated, but not polished, being somewhat weathered and pitted. Extensive areas of gneissic outcrop below marine limit, as well as outcrop along meltwater channels, have had striae removed. The schistose rock surfaces north of Ross Bay are generally rough and faintly striated or grooved. Striations have been weathered off marble outcrop, which tends to have granular, gruss-covered surfaces and rounded forms due to postglacial weathering; larger grooves remain faintly visible. Marble outcrops are generally bare because of plant toxicity to calcium or lack of nutrients.

Regional striation trends are less apparent on southern than on northern Melville Peninsula, where there is a major west-east orientation, or on other parts of the shield, where parallel regional ice flow is the norm. The pattern on southern Melville Peninsula is complex. Over the northwestern half of the area, the main trend is northwesterly towards the coast of Committee Bay, parallel to larger glacial erosion landforms. In the southwest, striations trend onshore from Repulse Bay, and swing from northwest to north. In the south, striations trend towards the coast, although there is evidence of movement both northwards and southwards in Lyon Inlet. In the east, striations tend to be splayed northeast to southeast towards the east coast, but there are many local variations to

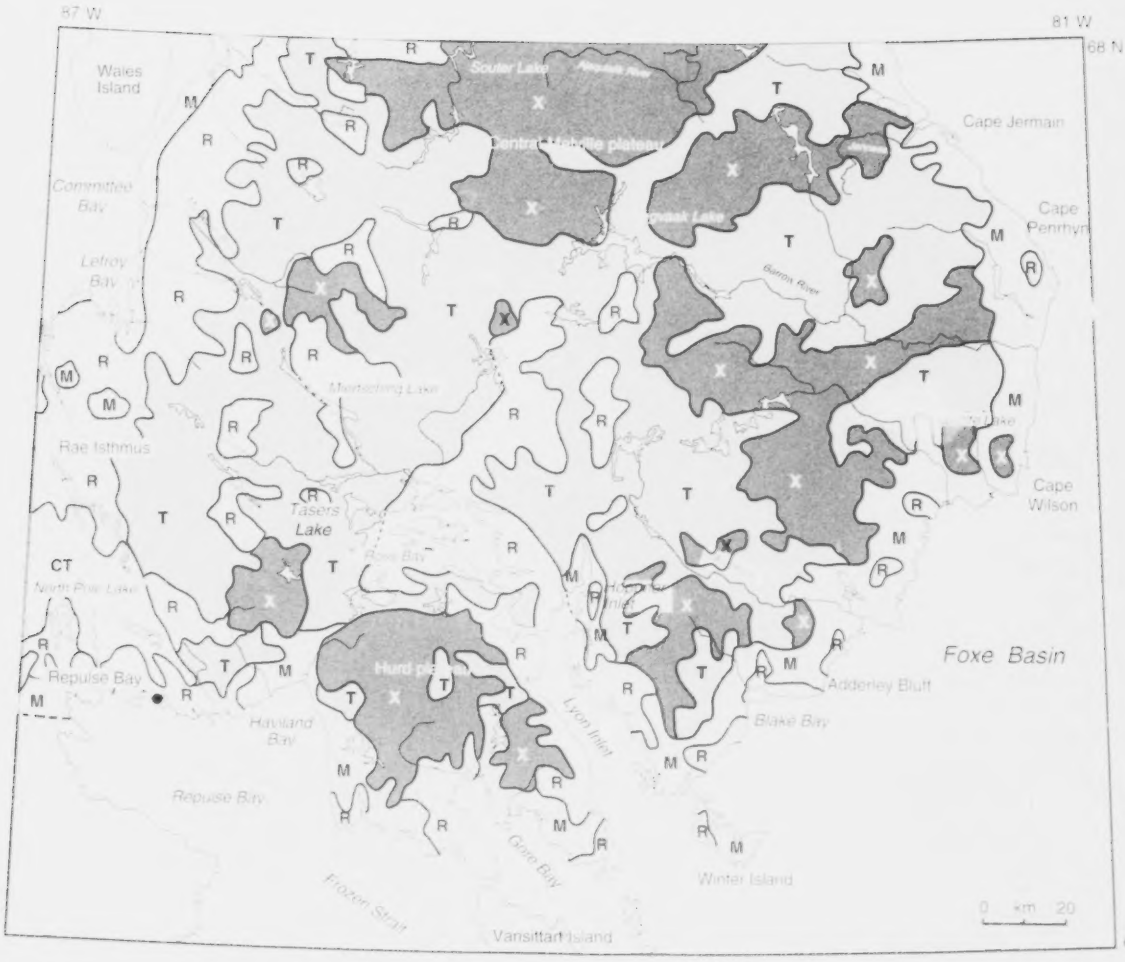


Figure 13. Generalized map of surficial materials.

this pattern, and multiple striation orientations, including a north-south trend. Crossed striae are present at many sites. The crossed striae are due to changing positions of ice divides and outflow centres, and changes in the importance of topographic control over flow during the course of the last glaciation.

Rock drumlins, roches moutonnées, and crag-and-tail forms in the order of metres to decametres in height are abundant in some areas. There are three main fields of these forms. One field oriented north-northwest crosses Rae Isthmus from Repulse Bay to Committee Bay; others, oriented northwestward, cover extensive areas along Meertsching Lake and east of the Melville Moraine. The distribution of erosional streamlined forms appears to relate to main and late glacial ice-flow patterns, particularly to areas of accelerated glacial flow due to ice streaming into calving bays. Although well formed roches moutonnées are not developed along the outcrop forming Adderley Bluff in the southeast part of the study area, plucked blocks indicate glacial overriding to the southeast.

In the Prince Albert Hills and adjacent parts of southern Committee Bay, deep U-shaped glacial troughs lie along faults oriented west and northwest (Fig. 8). In some of these areas the remaining wall rock is chloritized or has an intense

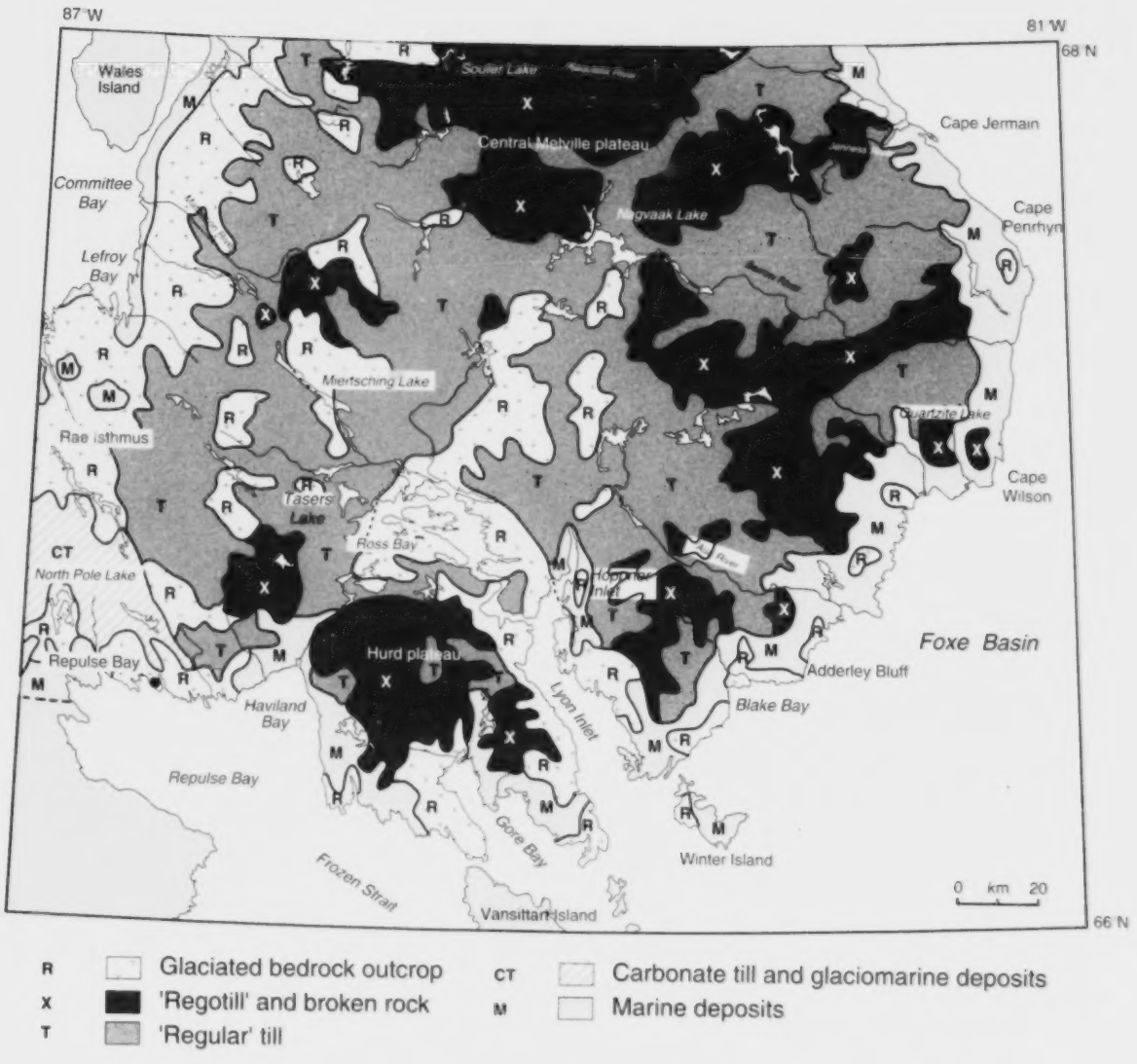


Figure 13. *Generalized map of surficial materials.*

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Figure 14.

Till plains and streamlined rock forms, station 3253 inland from Cape Jermain. Glaciers moved toward the northeast (left), streamlining gneissic rocks (middle ground), and plucking joint blocks from marble (foreground). Photograph by L.A. Dredge. GSC 1997-043D

red hue, suggesting alteration of iron compounds. These conditions strongly suggest that the ice sheet exploited already weak and weathered zones in crossing through the western hills. The largest troughs are parallel to regional ice-flow directions, but smaller glacial troughs in the western hills depart considerably from the regional ice-flow trend, and probably relate to very early, or very late glacial events, when ice on the uplands was thin.

In the eastern part of the map sheet, where regional ice-flow directions were parallel to rock structure, glaciers preferentially eroded the marbles of the Penrhyn Group, forming broad till-filled troughs in northeast-trending structures. The sides of the troughs are composed of more resistant gneiss or schist; however, in central and western parts of the map area, where ice flow was at right angles to rock structure, marble belts were eroded much less. Glaciated outcrop in these areas has much less relief.

Broken rock and felsenmeer (unit 1)

Broken rock and felsenmeer cover only about 1% of the total area; however, immature blocky till (units 2 and 3) covers an additional 3% (1200 km^2); this terrain could also be regarded as felsenmeer or boulder fields, although it is not purely broken rock. Broken rock and/or felsenmeer occurs in two situations: where there is much postglacial frost shattering of glacierized outcrop, and/or where there was minimal glacial sliding.

Precambrian and Paleozoic rock types have broken differently. On Precambrian granitoid rocks this unit consists mainly of angular, to slightly abraded, joint-bound blocks derived from the underlying bedrock (Fig. 15). Patches of this type of terrain lie on the central Melville plateau, the uplands east and west of Lyon Inlet, and an area north of Haviland Bay. As seen in section on the northern part of Hurd plateau where meltwater channels are incised into gneiss, the widest joints occur in the surface layer; the blocks are more closely spaced at depth, and ultimately merge into ruptured, jointed bedrock at about 1.5 m depth. Where the broken rock has been frost-heaved, angular blocks measuring 0.5–2.5 m across are stacked up to three deep. There are no sorted circles in this terrain.

Broken rock and/or felsenmeer on marble generally consists of granular rubble composed of mineral crystals. Felsenmeer on the carbonate lowlands of Wales Island forms broken limestone pavements where horizontal bedding planes lie near the surface, or debris piles composed of several layers of limestone slabs that have been frost heaved from the coherent rock. Surface slabs have been pitted by postglacial weathering.

The broken rock and/or felsenmeer unit grades into unit 2, regotill veneer, where, however, more recognizable erratics are present, and some blocks have been glacially abraded and transported short distances.

Felsenmeer is being created at present by frost heaving through volumetric ice expansion in open joints, by water migration and ice segregation along hairline discontinuities, by hydration weathering in carbonate rocks, and by dissolution of marble. The fact that felsenmeer on the central Melville and Hurd plateaus merges with regotill suggests that some shattering there may have occurred before or during glaciation as well. Rupturing of the weathered bedrock on the plateaus could have occurred by frost shattering prior to glaciation, or by glacial crushing and frost action under the central part of an ice sheet during glaciation.

Regotill–bouldery local till (units 2, 3)

Regotill (local till on the maps) refers to material consisting largely of bouldery regolith that has been glacially transported for short distances. It appears as diffuse grey tones on airphotos. For regotill veneer, underlying rock structures are faintly visible on airphotos, but compositional boundaries are fuzzy. Regotill covers 24% of southern Melville Peninsula (9600 km^2).

Figure 15.

Angular, broken rock forming felsenmeer on the Hurd plateau, station 2471. Photograph by L.A. Dredge. GSC 1997-043KK

Figure 16.

Regotill: slightly abraded boulders from nearby source rocks, and large vegetated mud boils with small active centres, station 2479. Field book (centre left) is 22 cm long. Photograph by L.A. Dredge. GSC 1997-043FF

The largest units cover the central Melville plateau at elevations greater than 300 m, and the Hurd plateau west of Lyon Inlet at elevations higher than 200 m. Other regotills lie at lower elevations west of Ross Bay and between Lyon Inlet and Cape Penrhyn. In all cases, the edges of regotill units grade into regular till, and for those areas east of Lyon Inlet, areas mapped as regotill are actually a mix of the two till types. Regotill is largely unvegetated except for lichen cover on boulders, and small shrubby plants on inactive mud boils.

Landforms

On the central Melville and Hurd plateaus, regotill corresponds to the area of peneplain hillslopes lacking a glacial grain; except for one preglacial river valley, there are no rivers and no glacially eroded lake basins. Other areas of regotill (Fig. 13) have more relief and contain a few glacially eroded lake basins.

Regotill is extremely bouldery terrain but contains some matrix. The land surface is typically covered with a bouldery blanket 1–5 m thick. Where regotill tends to be thickest, on the west side of the central Melville plateau, there are some deep ice-block depressions within it. Boulders are sorted into high centre polygons or stone circles having small sandy centres surrounded by wide blocky rims. The stone circles are commonly 3–4 m across, considerably larger than in regular till. Active centres are commonly 0.5–1 m across; the remainder of the central area is vegetated (Fig. 16). Large solifluction lobes, of a size that is mappable on 1:60 000 airphotos, are present in some places. These lobes have blocky frontal ramparts up to 3 m high. Ice-wedge polygons up to 30 m across have been mapped within regotill in some places, as have sets of parallel fissures on the central Melville plateau that are described in the section on 'Permafrost conditions and periglacial processes'. Although the terrain lacks

features indicative of glacial erosion, extensive areas, particularly on the central Melville plateau, show evidence of glacial ablation, with meltwater erosion (Fig. 17).

Texture and composition

Boulders and rock blocks

The till on rolling uplands consists of extremely large, angular to subrounded, chiefly granitic and gneissic rock fragments in a matrix of very stony granular sand. Boulders commonly cover more than 50% of the land surface. The boulders in the till are a mix of weathered and frost-shattered rock; large, glacially shoved rock rafts up to 5 m across that have been transported only a few metres; and smaller, abraded glacially eroded and transported boulders.

In typical regotill, large boulders consist of local rock types. In many places, all boulders are of the same lithology as the underlying rock type, and were obviously transported only short distances at the base of the ice. Debris from quartz veins indicates that the distance of transport of large clasts is in the order of 10 m or less. Smaller boulders are also of fairly local origin, as can be clearly seen by the proximity of gossanous boulders to Prince Albert Group gossans on the west part of the central Melville plateau.

Blocky boulders are generally firm and are of granitic or gneissic lithology; some are joint-bound blocks that have angular shapes, but with edges slightly abraded, either by glacier action or frost action. More rounded boulders tend to be derived from marble or granitoid rocks whose surfaces have been rotted and weathered, although some rounding probably occurred by glacial or meltwater abrasion. Quartz and pegmatite veins protruding about 3 cm above the main rock surface indicate the extent of surface weathering of gneissic rocks.

Despite the prevalence of local rock types, some abraded boulders that are from more distant sources have been mixed in with the local clasts. An example is a marble boulder in regotill on the Hurd plateau in an area of gneissic bedrock. Limestone boulders are rare in pure regotill, but one was seen northeast of Ingiqqanilik Lake in the regular till–regotill hybrid area, and one in regotill east of Lyon Inlet in granite terrain.

Pebbles

Pebble-sized clasts are abundant, and are angular to subrounded. The lithology of the clasts indicates that they all derive from Melville Peninsula, and most are from rock sources near the collection sites. In some places, the pebble component consists of angular feldspar laths that have weathered out of the rock.

Matrix

The matrix component ranges from granular oxidized gruss and coarse sand, to silty sand. Material in mud boils is commonly reddish-yellow to orange-brown, indicating weathering. The presence of additional, fresh, unweathered silt grains suggests that glacial abrasion, as well as ice-load crushing has occurred during the last glaciation. Regotill contains many more boulders and pebbles than regular till, a principal textural distinction: the matrix is similar to regular till, although there is slightly more granules and sand, and less silt and clay (Fig. 18; Table 1). The granule content averages 9% of the total matrix weight, and ranges between 1% and 43%. The sand content averages 66%, and ranges from 26% to 94%. Silt averages 21% of the matrix and ranges between 1% and 55%, and is lowest in areas where ablation features are visible. Clays average only 4%, but range between 0 and 31%. The major components of the clay fraction are smectite, illite, and chlorite. Feldspar is a common minor component, and quartz and amphibole are present in trace amounts. There are no carbonates in the silt-clay fraction of regotill on the Hurd plateau, and between 0 and 3% on the central Melville plateau. There is no carbonate at most sites between Lyon Inlet and Cape Penrhyn, but up to 8% in a few places where the underlying bedrock is marble. There is one site with 5% carbonate west of Cape Penrhyn where limestone pebbles were also found.

Figure 17.

Areas of unmodified regotill (higher areas), and extensive areas that have been washed by subglacial meltwater, leaving a boulder lag, station 3116. Photograph by L.A. Dredge, GSC 1997-043JJ

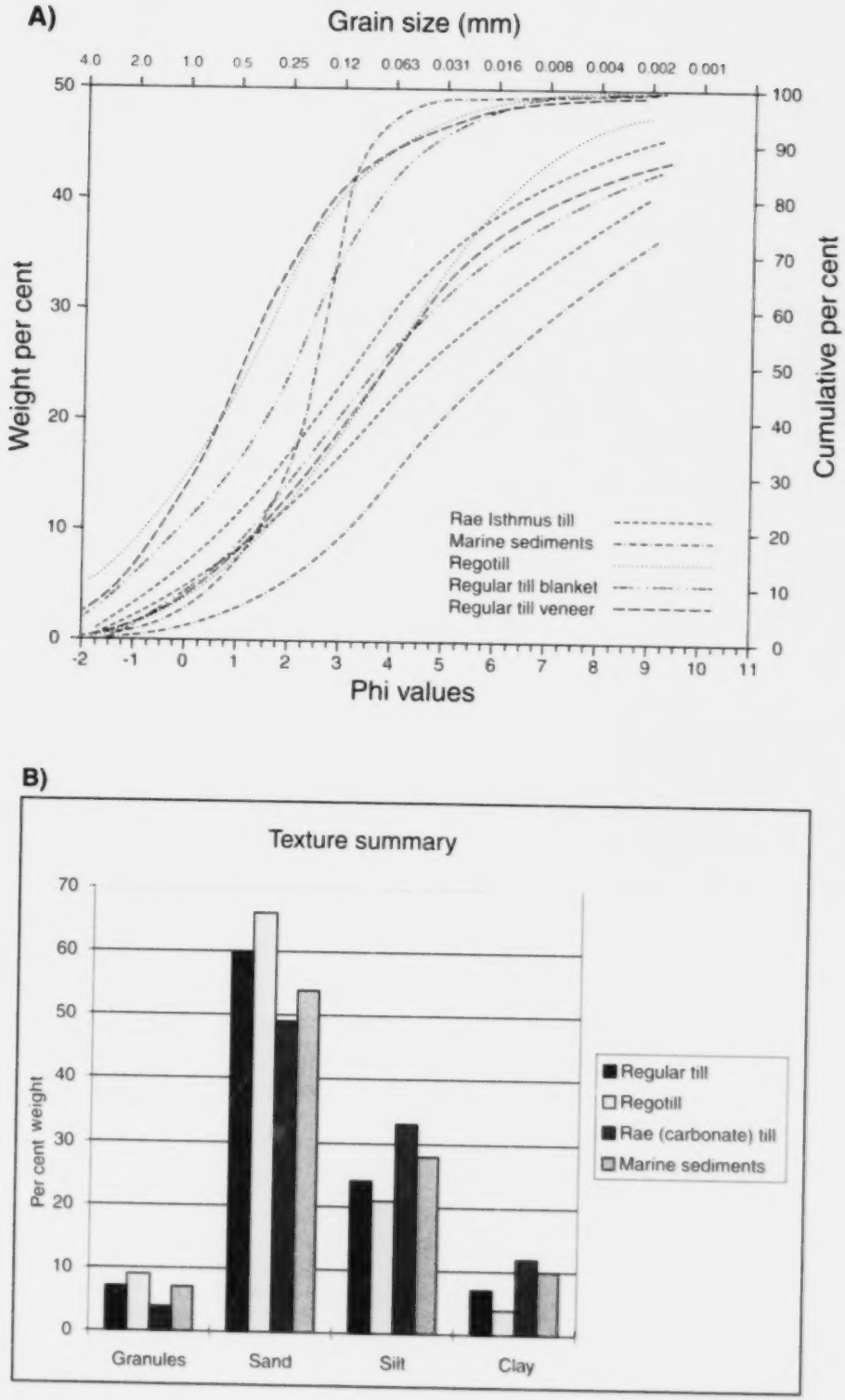


Figure 18. *Textural characteristics of till and marine sediment: **A**) grain-size curves, **B**) summary bar chart.*

Material tends to be loosely compacted, and wet in summer. High moisture contents are due to the persistence of snowfields late in the summer, poor drainage in areas of thin till, and shallow active layers.

Origin

The regotill merges with unit 1, broken rock and felsenmeer, and most of the "till" could be regarded as slightly glacially modified regolith. The material is mapped as till for the following reasons. 1) Most of the blocks appear to have been moved from their original position, although they are of the same lithology as the underlying bedrock substrate. This is most apparent in the case of short boulder trains from quartz veins and mafic dykes. 2) The centres of stone circles, while consisting largely of gruss, also contain some fresh silty material that is probably rock flour resulting from glacial grinding of rock fragments; however, the predominance of large clasts and lack of evidence for widespread glacial abrasion (such as regular till, striae, or ice-scoured lake basins) suggest that much of the previously existing material was not comminuted into a normal till. The main questions regarding regotill are 1) whether it simply represents cold-based zones underlying parts of a regional ice sheet that flowed across the peninsula, or whether regotill areas are related to positions beneath ice divides or flow centres where there was little ice flow; and 2) whether either of these conditions changed over the course of the last glaciation.

Regotill areas between Lyon Inlet and Cape Penrhyn, and also north of Haviland Bay have many characteristics transitional between regotill and regular till, suggesting that there were periods when the ice there was warm-based and eroding. Crossed striae in these areas suggest that flow centres shifted during the course of the last glaciation.

'Regular' till derived from local ice (units 4–6)

'Regular' till (units 4–6) is the predominant surficial material on southern Melville Peninsula, covering 39% (15 600 km^2) of the map area. Deposits of regular till relating to Melville Ice are widespread above postglacial marine limit. Till generated by Foxe Ice underlies marine deposits on Rae Isthmus.

Thickness and landforms

The till has been subdivided on the basis of thickness into veneers, blankets, and hummocky morainal deposits.

Till veneer

Till veneer is less than 1 m thick, and the surface mimics the form of the underlying rock; because till veneer is not thick enough to mask the roughness in the underlying bedrock, rock structure is expressed on the till cover. The till tends to be discontinuous, and patches of bedrock are included in the unit. Till veneer is extensive south and west of Nagvaak Lake (Fig. 19), and is interspersed with till blankets over the rest of

Table 1. Textural statistics for till and marine sediments on southern Melville Peninsula.

	Granules (%)				Sand (%)				Silt (%)				Clay (%)				
	x	s	min	max	x	s	min	max	x	s	min	max	x	s	min	max	N
Regular till	7	3	0	32	61	9	37	96	25	8	1	48	7	5	1	25	339
Regotill	9	5	1	43	66	11	26	94	21	10	1	55	4	4	0	31	169
Rae till	4	1	1	7	50	13	13	75	34	9	18	65	12	7	1	26	27
Marine	7	7	0	39	54	22	6	94	28	17	1	69	11	10	1	40	69

x = average s = standard deviation N = number of samples

Figure 19.

Till veneer north of Nagvaak Lake, station 3157. Thin cover of bouldery till with a silty sand matrix. Photograph by L.A. Dredge. GSC 1997-043K

the area. Surfaces are rubbly and mud boils are absent in some areas (NTS 46N). The main glacial landforms within this unit are striations and streamlined rock forms such as roches moutonnées. Streamlined forms are prevalent features west of Nagvaak Lake (Fig. 19), where they are oriented west and northwest, and near Miertsching Lake, where they are oriented northwest.

Deposits vary in density from loose to compact, but are commonly loose. Drainage is poor in some areas due to proximity of impermeable bedrock, and pore pressures may be high during snowmelt. Till veneer is sparsely vegetated with tundra-heath, and appears on airphotos as a medium-grey tone, distinguishably darker than regotill and felsenmeer.

Till blanket

Till blankets are from 2 m to more than 10 m thick, forming undulating, gently rolling till plains with numerous lakes in ice-scoured depressions. Boulders are scattered to moderately numerous on the till surface (Fig. 20). Drumlins, rock-crag and till-tail forms, and roches moutonnées are the main medium-scale landforms. Drumlins oriented west and northwest are prevalent in the west-central part of the area, and scattered forms oriented northeast-southwest are present on the eastern plains. Smaller landforms include end moraines marking recessional position of ice tongues in glacial troughs east of Ross Bay. Most of the till surface has mud boils that are 0.5–1 m across, smaller than those in regotill. Centres typically are olive-grey over granitoid-derived till, buff in marble areas, and rusty red-brown in gossan areas; rims are pebbly. Large frost fissures and/or ice-wedge polygons are present in a few places but do not appear to be related to particular terrain conditions. The till plains are well vegetated with grasses and tundra-heath, especially where marble-derived material has been mixed with granitoid material.

Till blanket deposits vary in density from loose to compact. Till in drumlins tends to be compact.

Hummocky till

Deposits of hummocky till, 5–30 m thick, are limited on southern Melville Peninsula. They occur primarily near the edges of regotill units on the central Melville plateau, Hurd plateau, and Aua River areas. Some of the units contain large ice-wedge polygons, and the hummocky till in the Aua River area is associated with massive kame deposits. On the central Melville plateau, the hummocky till may be morainal or may delimit edges of warm-based ice. On the Hurd plateau and Aua River areas, the hummocky till is more likely morainal, associated with the late melting of ice caps.

The Melville Moraine, a ridge feature composed primarily of hummocky till on northern Melville Peninsula, continues along the west coast of southern Melville Peninsula. In this area, however, it is composed primarily of glaciomarine deposits.

Texture

Regular till relating to Melville Ice is typically a silty-sand diamicton with boulders and pebbles. Boulders and cobbles are generally coated with fine particles. Despite glacial mixing, the boulder and pebble content of the till varies considerably across the region, but not everywhere in a predictable pattern. In general, however, the boulder content is greater, and boulders are larger and more angular in veneers than in till blankets. Also, there are more boulders and subangular clasts on till plains over granite and schist than in marble terrain, probably because marble was more easily broken and ground down. The least bouldery till is in marble terrain in the eastern part of the map area, and also the drumlin fields west of Nagvaak Lake.

The matrix of regular till has been produced by the partial comminution of transported rock fragments and by the direct glacial grinding of exposed rock surfaces into the sizes of the mineral components. The texture of the matrix ranges from stony silty sand in till derived from granitic and/or gneissic rocks to granular silt where there is a quantity of highly comminuted marble. The texture of the till is summarized by

Figure 20.

Well vegetated blanket of till in marble terrain north of Hoppner Inlet, station 3008. Scattered marble erratics on the till surface are disintegrating, producing halos of gruss at their bases. Photograph by L.A. Dredge. GSC 1997-043X

the statistics in Table 1, which also shows that the differences between the matrix of regular till and regotill are quite small. Grain-size curves from various till types also show the degree of textural variation (Fig. 18). The average texture of the regular till matrix is 7% granules, 60% sand, 24% silt, and 7% clay, but there is wide variation. Granules, consisting of small lithic fragments, range from 0 to 32% of the matrix, and are common to both marble- and granite- and/or gneiss-derived till. The sand content ranges between 37% and 96%, with the higher values corresponding to areas with substantial granitic components to the till. Also, till veneers are sandier than blanket deposits because materials have not been ground down to terminal grade, as discussed in Dreimanis and Vagners (1971). Silt contents range from 1% to 48%, and are highest in marble terrain on the eastern part of the drift sheet. Clay content within the till ranges between 1% and 25%, and follows a pattern similar to the silt, highest contents being in an area east of Miertsching Lake. Till on southern Melville Peninsula has considerably less silt and clay than in the northern part, where much of the till has a component of far-travelled, ground-up Paleozoic limestone from exotic sources (Dredge, 1995a).

Lithic composition

Boulder lithologies

Most of the boulder-sized clasts in the till are granite, gneiss, and schist derived from the peninsula. These boulders are blocky, with rough surfaces and subangular to subrounded edges. Marble boulders are also common, both in areas underlain by marble bedrock, and in other parts of the till sheet. These boulders are up to 2 m, have been rounded by glacial abrasion, and commonly have halos of spalled calcite surrounding their bases (Fig. 20). Iron-oxide-stained boulders containing pyrite and pyrrhotite are found mainly in association with clasts of marble and pelitic schist. Rare limonite-stained boulders containing magnetite relate to Prince Albert Group sources in the northwest part of the map area (northern part of NTS 46 N). Many of these were found directly down-ice of gossans marked on the accompanying maps.

Paleozoic limestone boulders are common on till surfaces below the limit of postglacial marine submergence (Fig. 21), where they could either have been introduced by sea ice or glaciers. They are rare above the marine limit. They are found mainly in the northeast part of the peninsula, and east of Hoppner Inlet. Possible sources of these clasts lie within Foxe Basin east of the peninsula, and beneath Hoppner and Lyon inlets. In the northeast, a few Paleozoic limestone boulders were recorded at sites up to 70 km inland, and were found in quantity east of Nagvaak Lake (at stations 3337 and 3338) at 67.5°N, 83°W. Several sandstone boulders from either Paleozoic formations or peninsular Cape Penrhyn sources were seen nearby along the south shore of Nagvaak Lake.

Gabbro boulders are common near dykes and were used to determine directions and distances of glacial transport. In contrast to the long distance transport of boulders in carbonate till areas on northern Melville Peninsula, the distance of transport for the dyke rocks in the Barrow River area was only about 1.5 km, and most of the dyke clasts were found within 200 m of their source. Similar travel distances were determined by tracing quartz boulders from quartz veins. In all cases, ice flow was eastwards, towards the coast.

Limestone and marble in the pebble fraction

Most pebble clasts are fragments of granitoid rocks and schist, which are the main rock types and also the hardest rocks in the area. Limestone, marble, dyke-rock clasts and gossan clasts are also present. Figure 21 shows the distribution of limestone in the pebble fraction of the till and marine sediments. Most limestone clasts lie below the limit of marine submergence, and, as with limestone boulders, could derive either from sea-ice rafting or from impingement of ice from Foxe Basin onto the land; however, there are 15 sites with limestone clasts in regular till above the marine limit, all on the eastern side of the peninsula. There are none in regotill.

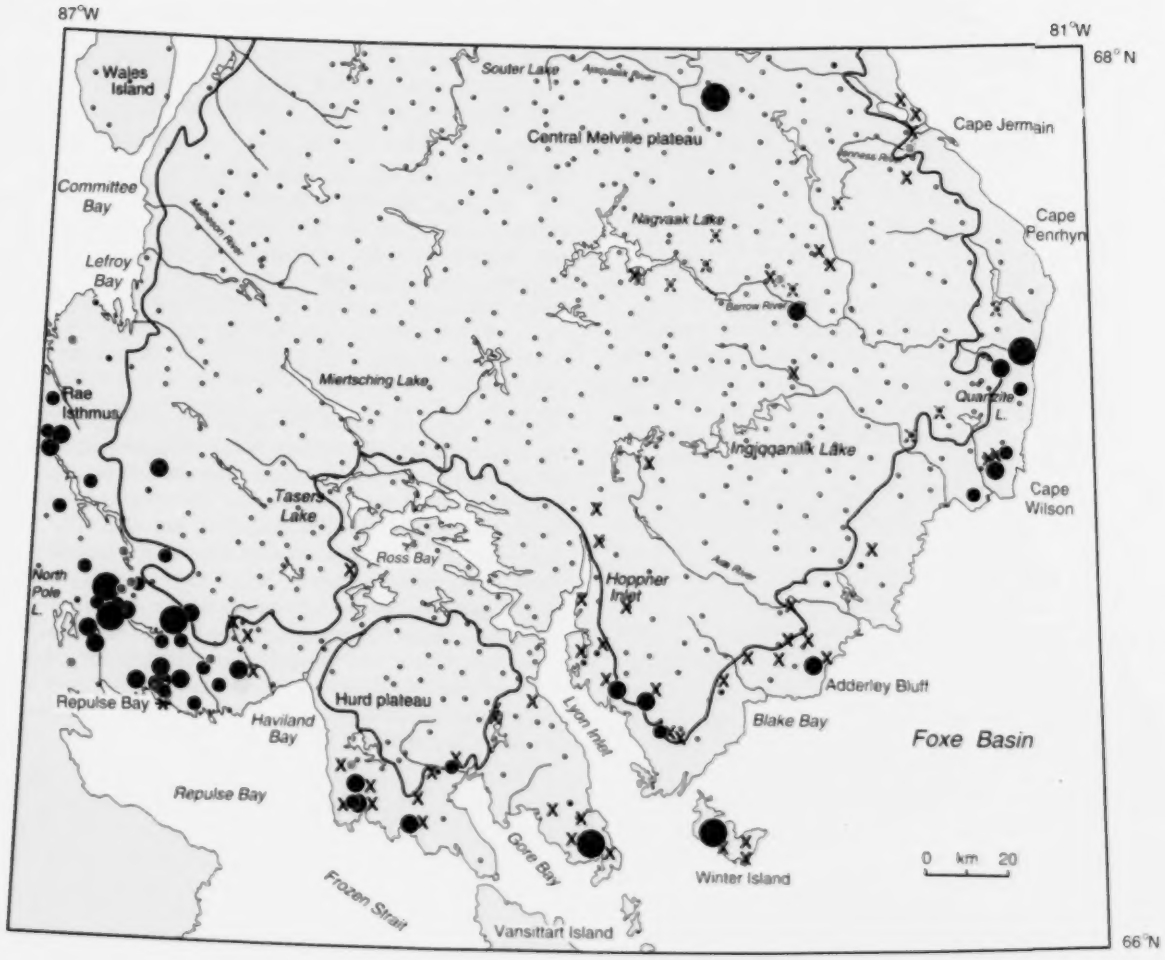
North of Cape Wilson limestone clasts are found as far inland as Nagvaak Lake. Where they are present, in most cases they constitute less than 5% of the pebble component, but at two sites they are 70% (site 3322) and 38% (site 3335). The presence of limestone pebbles means unequivocally that ice from Foxe Basin crossed into at least parts of southern Melville Peninsula at some time, but may never have reached those areas covered with regotill. There is one additional site above marine limit containing limestone pebbles directly east of Lyon Inlet. At this locality, the limestone could have been transported by ice flowing across carbonate rocks that lie beneath Hoppner and Lyon inlets.

The high percentage of limestone clasts below marine limit between Cape Penrhyn and Cape Wilson suggests that they could have been emplaced by sea-ice rafting from Paleozoic limestone outcrop in Foxe Basin or from northern Melville Peninsula; however, very low concentrations of limestone farther north in the Cape Jermain area, which is underlain by carbonate bedrock, suggest that this hypothesis is unlikely. Probably, the limestone clasts were deposited by glaciers flowing out of Foxe Basin and impinging on the east-central part of the coast. The ice event which emplaced the more numerous pebbles near the coast could be different from that producing more widespread dispersal of low quantities of limestone clasts over the inland area.

Marble clasts are present in till in concentrations up to 32%, particularly in areas underlain by marble bedrock (Fig. 22). Even in these areas, such as north of Ross Bay, percentages are typically only 2–10%, probably because the marble tends to crush easily into finer (granular) fractions. Most sites have no marble pebbles.

Carbonate in the silt and clay fractions

On southern Melville Peninsula, carbonate can be locally derived from marble or from alteration of minerals in granitoid rocks, such as plagioclase feldspar. The contribution from granitoid weathering is considered to be from 0 (mainly) to an upper limit of 3% of the total carbonate. Another potential carbonate source is the Paleozoic limestone and dolomite that underlies Foxe Basin and Hoppner



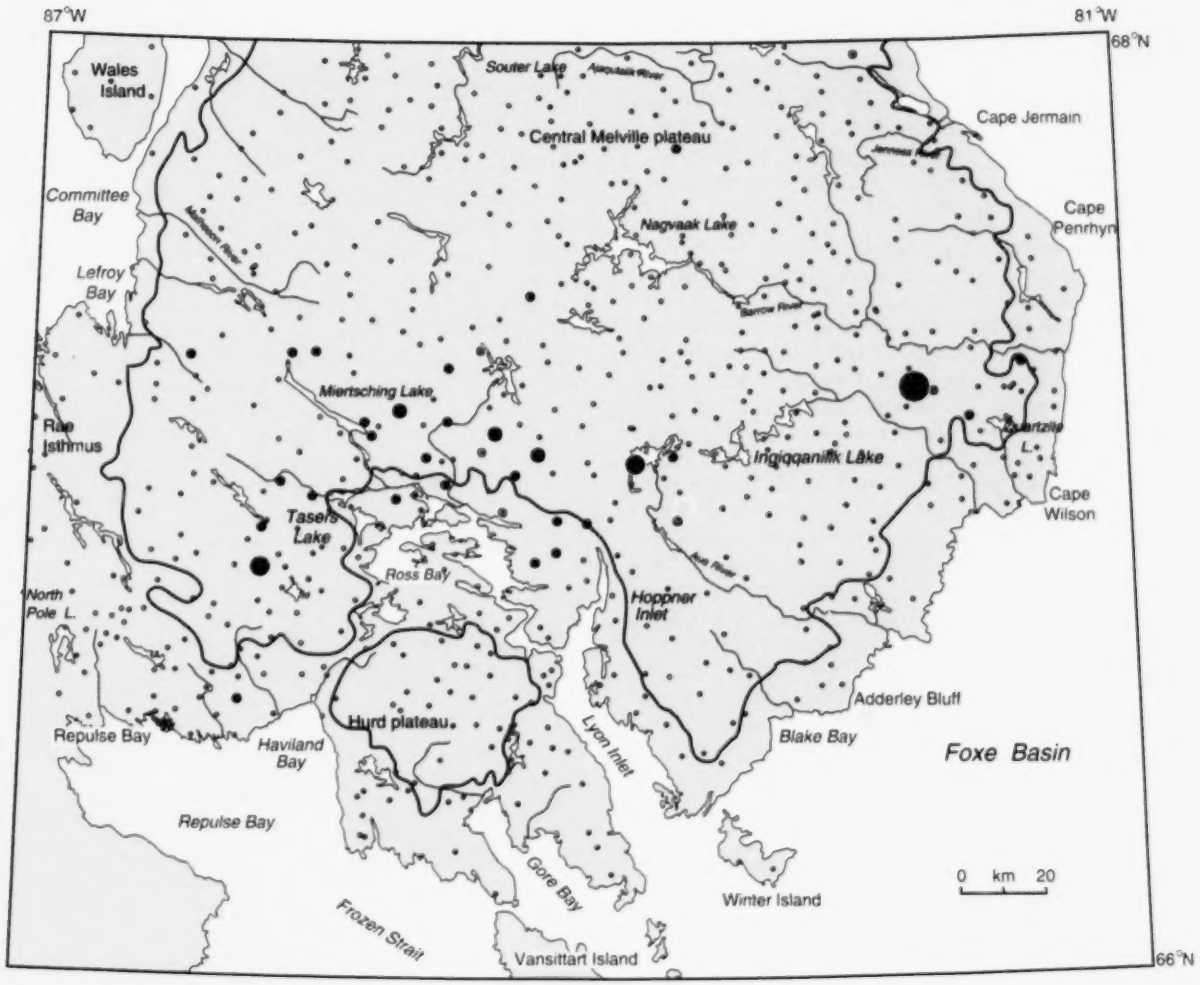
Southern Melville Peninsula
Limestone pebbles

Range %	Number of samples
51 to 75	(7)
26 to 50	(23)
16 to 25	(23)
11 to 15	(9)
2 to 10	(21)
0 to 1	(521)

Limit of postglacial marine submergence

X Limestone boulders

Figure 21. *Distribution of limestone pebbles and boulders in till.*



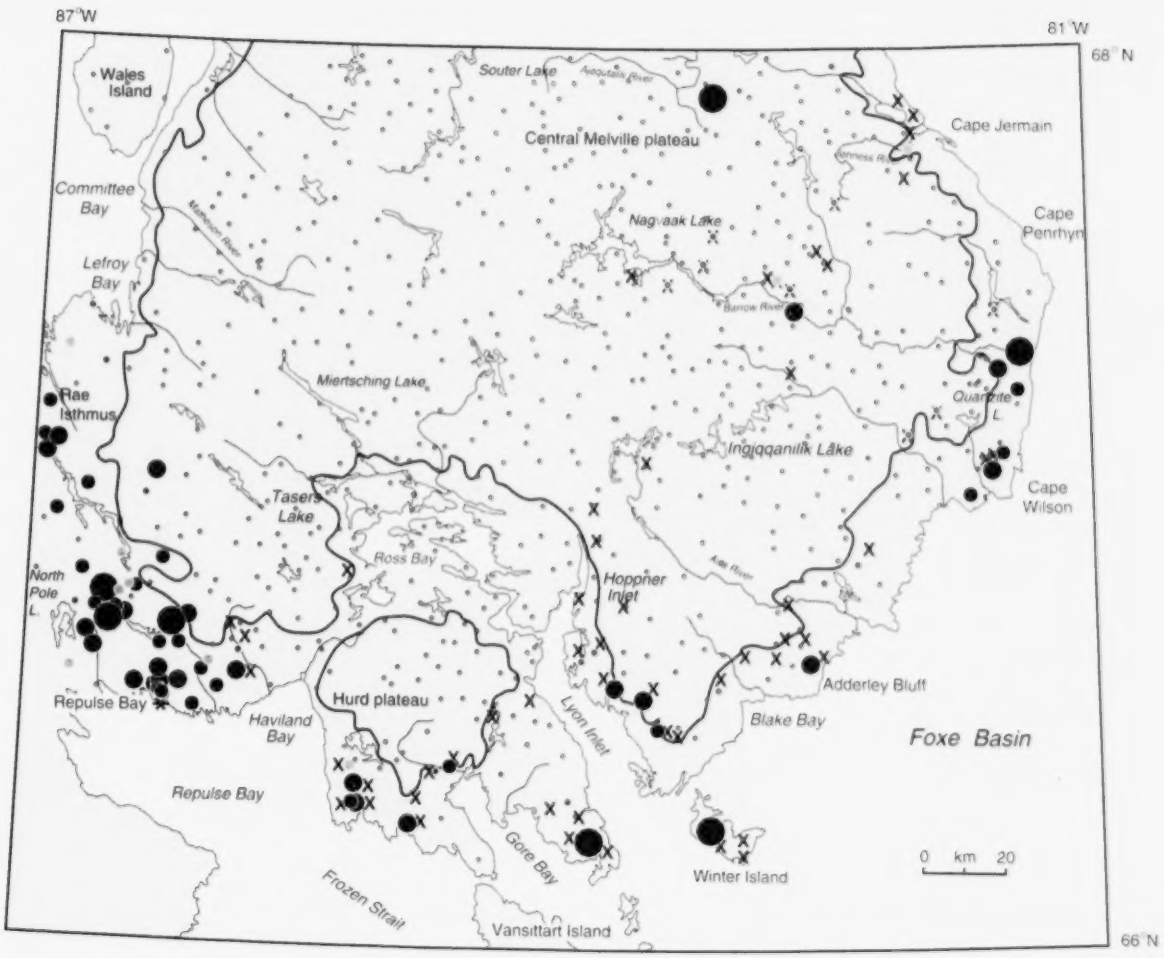
Southern Melville Peninsula

Marble pebbles

Range %	Number of samples
31 to 35	(1)
21 to 30	(2)
11 to 20	(3)
6 to 10	(5)
2 to 5	(25)
0 to 1	(568)

Limit of postglacial marine submergence

Figure 22. *Distribution of marble pebbles in till.*



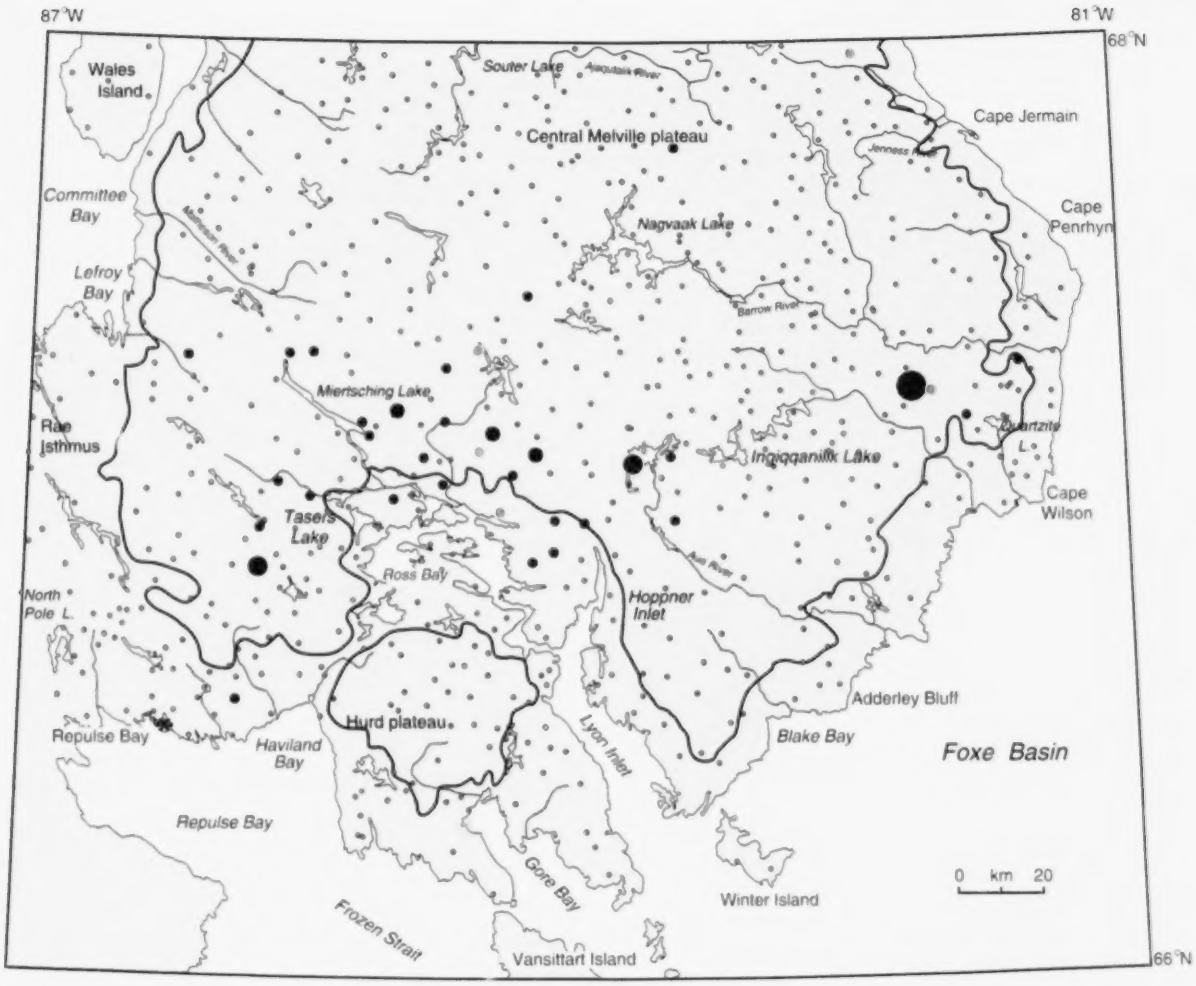
Southern Melville Peninsula
Limestone pebbles

Range %	Number of samples
51 to 75	(7)
26 to 50	(23)
16 to 25	(23)
11 to 15	(9)
2 to 10	(21)
0 to 1	(521)

Limit of postglacial marine submergence

X Limestone boulders

Figure 21. *Distribution of limestone pebbles and boulders in till.*



Southern Melville Peninsula

Marble pebbles

Range %	Number of samples
31 to 35	(1)
21 to 30	(2)
11 to 20	(3)
6 to 10	(5)
2 to 5	(25)
0 to 1	(568)

Limit of postglacial marine submergence

Figure 22. *Distribution of marble pebbles in till.*

Inlet, Committee Bay, also underlain by carbonate bedrock, lies down-ice of areas with carbonate in the till, and is therefore ruled out as a source area.

Carbonate contents of the matrix fraction of till and marine sediments (Fig. 23) were determined using LECO weight methods on the <0.063 mm fraction. With the LECO method, carbonate is calculated by carbon loss-on-ignition, and expressed as calcium carbonate equivalent.

Carbonate in the silt-clay fraction of the regular till ranges between 0 and 40% over 340 samples. Most till sites had no carbonate. Concentrations from 5% to 20% are common north of Ross Bay, in areas of marble bedrock and where marble pebbles (2–6%) are present but limestone pebbles are absent. It is thus thought that this carbonate is marble-derived. A number of sites in the northeast (Barrow River map area, Map 1849A) have carbonate contents between 2% and 12%. Carbonate concentrations of less than 3% may be background values, possibly derived from weathering of local granitoid rocks. The remainder are either from marble or limestone sources. Since elevated carbonate contents do not correspond with belts of marble in the northeast, or from down-ice transport from the marble sources, much of the carbonate is probably from Foxe Basin limestone. Furthermore, sites with highest concentrations correspond to areas with limestone clasts. The data from the silt-clay fraction supplements conclusions derived from the distribution of limestone in the pebble fraction of the till, and suggests that Foxe Basin ice crossed the northeastern part of southern Melville Peninsula at some time. This idea is especially reinforced if sites north of Nagvaak Lake with carbonate contents of 1–3% are also considered to be derived from limestone.

In a broader regional context, the carbonate contents are much less than on northern Melville Peninsula, where concentrations over 80% are common on the east side of the peninsula in till overlying granitic rocks near the Paleozoic contact, and carbonate concentrations remain at 30–50% over much of the northern Melville Peninsula more than 100 km west of limestone sources. The much lower concentrations on southern Melville Peninsula indicate major differences in ice dynamics and provenance.

Minerals in the clay fraction

In contrast to regotill, minerals in the clay size range (<0.002 mm) of the regular till are chiefly rock flour. In the more granitic tills, the main minerals are feldspars, although in some cases, illite and smectite are major components, while feldspars and chlorite are minor components. The chlorite and illite are derived from the postglacial weathering of amphibole and feldspar. East of Miertsching Lake, where the till is clayey, kaolin is also present as a major mineral. Quartz and amphibole are present in trace amounts in clays in most till samples, and are more common in the silt and sand fractions, in accordance with crushing habits of these minerals (Dreimanis and Vagners, 1971).

Concentrations of various elements in the clay fraction are discussed under the 'Till geochemistry' section, and element data are summarized in Appendix D ('Trace element geochemistry for till samples').

Origin

The compositional character of the till, together with striation data, indicate that ice flow was primarily from Melville Peninsula, but the presence of limestone clasts in low concentrations indicates that Foxe Ice crossed part of the plateau at some time, possibly during an early glaciation. Higher concentrations of limestone clasts, together with matrix carbonate, suggest that ice from Foxe Basin may have impinged on the east coast during the last glaciation. Glacial erosional landforms such as ice-scoured lake basins, striae, polished rock, streamlined rock forms and glacial troughs, together with depositional forms such as till blankets and drumlin fields indicate that the ice was erosive and warm-based. Concentrations of streamlined rock forms in the till blanket across the west half of the peninsula suggest persistent flow of ice towards Committee Bay.

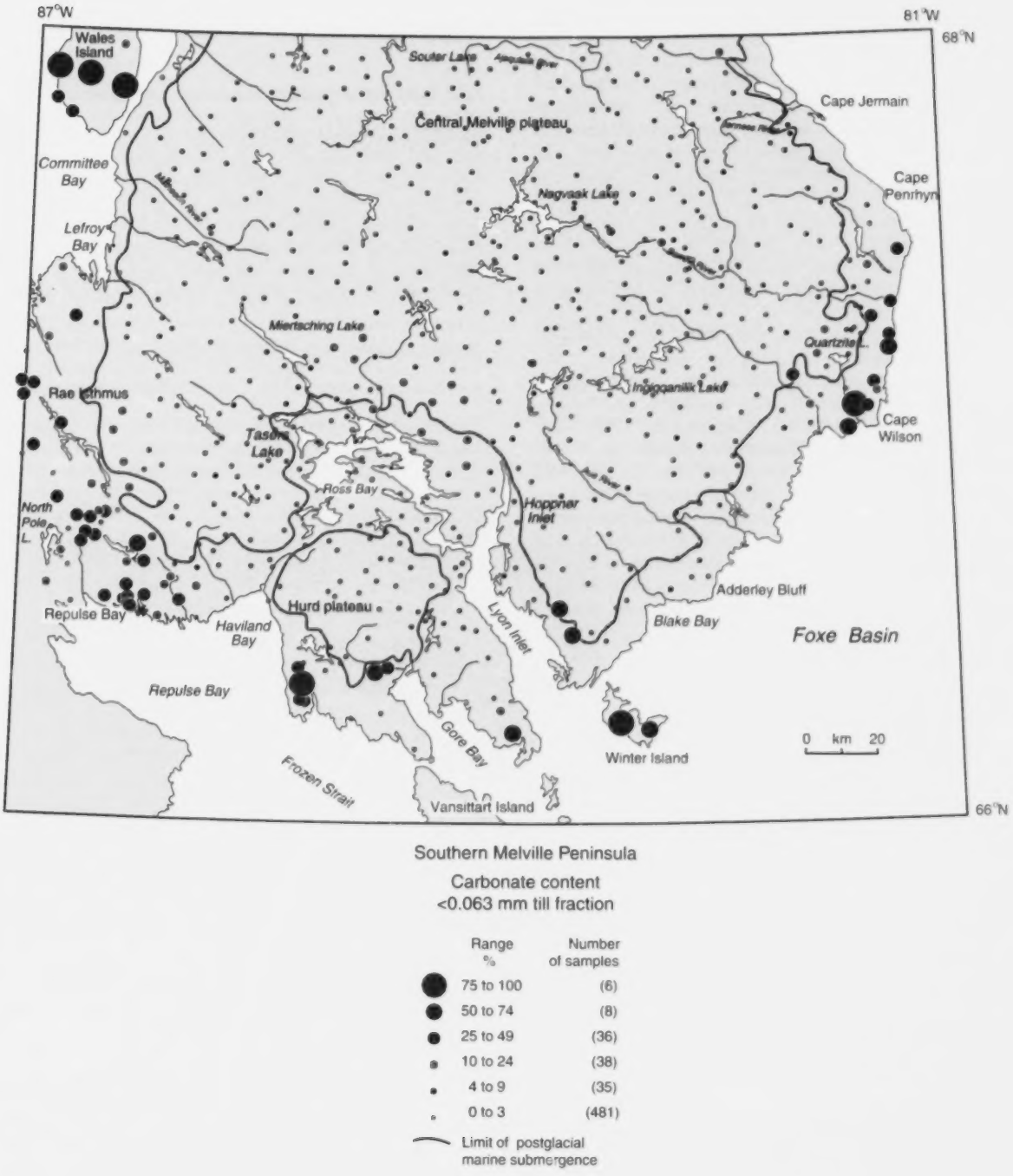
Rae Isthmus till: till derived from Foxe Basin ice (underlying and adjacent to unit 10)

Landforms

Although the northern part of Rae Isthmus is bedrock outcrop, most of the southern half is covered by stony, calcareous silty till. This till underlies all of unit 10, which is below marine limit, and laps above marine limit where the land rises on the east edge of Rae Isthmus. The surface is one of low relief and undulating form. Swarms of till drumlinoids with near-parallel orientations in a north-northwesterly direction are characteristic of this unit, and coincide in orientation to streamlined bedrock at Repulse Bay. Both granitic and limestone boulders are scattered over the surfaces of these features. Small, tan-grey, silty mud boils 0.5–1 m in diameter have developed on the till surface.

Texture and composition

On average, the texture is 4% granules, 49% sand, 33% silt, and 12% clay. The material has significantly more fines than granitic and gneissic till types on the peninsula (Fig. 18). Stones are subangular to subrounded. Limestone clasts, many of which are striated, comprise 8–56% (average about 25%) of the pebble fraction; the percentage is higher in the south than in the Committee Bay area to the north. The remainder of the pebbles are granitic or gneissic; marbles are rare even in areas of marble outcrop. The silt-clay fraction ranges typically from 11–15% carbonate (total range 7–50%), almost all of which is derived from limestone, not marble. Due to its silty texture and low relief, the till surface is wetter than till in other areas, and has a denser grassy vegetation cover. In some places the till is slightly plastic.



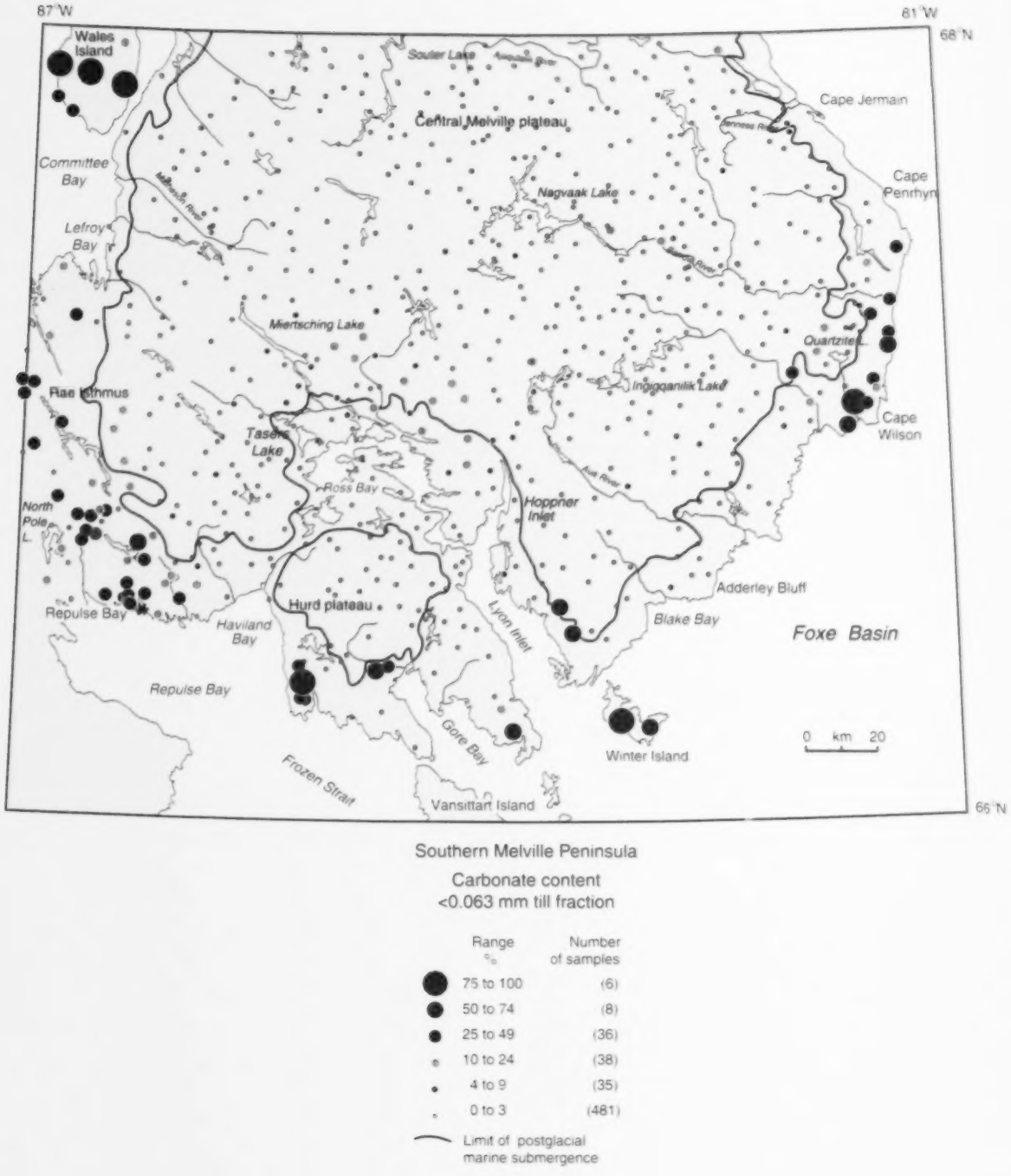
Southern Melville Peninsula

Carbonate content
<0.063 mm till fraction

Range %	Number of samples
75 to 100	(6)
50 to 74	(8)
25 to 49	(36)
10 to 24	(38)
4 to 9	(35)
0 to 3	(481)

Limit of postglacial marine submergence

Figure 23. *Distribution of carbonate in the silt-clay fraction of till and marine sediment.*



Southern Melville Peninsula

Carbonate content
<0.063 mm till fraction

Range %	Number of samples
75 to 100	(6)
50 to 74	(8)
25 to 49	(36)
10 to 24	(38)
4 to 9	(35)
0 to 3	(481)

Limit of postglacial marine submergence

Figure 23. *Distribution of carbonate in the silt-clay fraction of till and marine sediment.*

Calcite is the major mineral constituent of the clay fraction. Dolomite, smectite, and feldspar are minor components, whereas quartz and amphibole are present in trace amounts.

Origin

The silty character and calcareous nature of this till indicates that much of the material is derived, not from Melville Peninsula, but from more distant source areas in Foxe Basin. The materials on drumlinized surfaces grade into marine deposits, and resemble them in texture and composition (*see* unit 10 description). Although some reworking by marine processes has occurred at the surface, most of the material is considered to be till, emplaced by a grounded-ice sheet, for the following reasons. 1) The materials are associated with drumlin forms and also glacially polished and streamlined rock, both indicating the same ice-flow direction, and grounded ice conditions. 2) Although most deposits are below marine limit, some sites with carbonate till on the east side of Rae Isthmus are above levels reached by the postglacial sea. 3) Clasts are striated and subangular, not abraded and rounded as in modern littoral marine deposits. 4) For this area, the carbonate content is far too high to have been transported in from carbonate sources by waves and currents, or to be rafted in on sea ice: along the present shore of Repulse Bay, less than 10% of the clasts are limestone, and these are all rounded. Limestone clast contents and matrix carbonate contents are also much higher in the Rae Isthmus till than in raised marine deposits in the southeastern parts of the map area, which are closer to limestone rock sources in Foxe Basin.

Although Wales Island–Committee Bay is the closest area of limestone, the ice-flow indicators and high concentration of carbonate material in the southern part of the isthmus suggest that the till was transported from Foxe Basin via Repulse Bay by grounded, warm-based ice flowing northward, rather than from glacial ice or sea ice from Wales Island. Unlike surface till on the rest of the peninsula, this till is not local to the peninsula. The mechanism and dynamics of ice flow into Rae Isthmus may be similar to that which produced broad swaths of silty carbonate till on northern Melville Peninsula: it is possible that most of the till was emplaced by ice streams flowing through the isthmus.

Glaciofluvial deposits and landforms (units 7, 8)

Deposits of glaciofluvial origin are scarce on Melville Peninsula, and cover only 1% (400 km^2) of the terrain. Erosional forms are much more common than depositional landforms. Glaciofluvial landforms in areas of regular till differ from those in regotill. Most features (eskers, kames, and outwash) in regular till are thought to indicate warm-based ice conditions, whereas those in regotill areas are in keeping with cold-ice conditions, changing to warm ice during terminal phases.

Deposits and forms related to regular till

Eskers and flanking subglacial meltwater channels

Most eskers are small and discontinuous, typically less than 10 km long and about 5 m high. Some connect with subglacial meltwater channels which are broader and more continuous than the eskers within them. Along Hoppner Inlet and north of Blake Bay (Map 1851A), small eskers, commonly cobbly, indicate radial ice flow towards the south and east coasts. The eskers and related channels there tend to have branching feeders, indicating the presence of an organized subglacial drainage network and warm-based, erodible ice.

The biggest and longest esker (Barrow esker) begins as shallow, subglacial feeder channels cut into the till surface near Nagvaak Lake (Fig. 24) and the ridge trends northeastward for 35 km, across modern drainage systems, but parallel to the main glacial ice-flow direction in the area. The Barrow esker terminates in outwash. This esker, like the smaller ones, is segmented, and areas of unaltered till or washed till and rock separate esker segments, some of which are up to 10 m high and 20 m across. Parts of the esker are steep sided and are composed primarily of rounded cobble gravel of solely Precambrian lithologies, while more gently sloping areas are

Figure 24.

Bouldery lags mark the location of shallow subglacial feeder channels that have cut into the till surface at the head of the Barrow esker, station 3057. Photograph by L.A. Dredge. GSC 1997-043I

sandier (Fig. 25). Sand pads with frost cracks flanking the main ridge and splaying outward from it, are commonly located at the distal end of segments. These pads probably mark recessional ice-front positions.

In the northeast, erosional meltwater forms are more prevalent and more continuous than depositional features. The locations of meltwater conduits are commonly marked by parallel linear belts of bare, washed rock up to 1 km wide and 20 km long, and spaced about 5 km apart (Map 1849A). The bare rock zones are considered to be the product of removal of till by meltwater. Since these washed zones are juxtaposed with esker segments in some areas, they are thought to be subglacial, rather than proglacial forms. Since these pathways commonly terminate in marine limit deltas, they are probably late-glacial features. Their parallel habit and linear nature suggests that they developed near the ice margin, where surface slopes and glacial hydraulic gradients were steepest (Shreve, 1972).

Distinctive erosional features along esker pathways on relatively soft marble terrain include smooth, small-scale runnels, created by subglacial meltwater. Where marble bedrock forms the bottom of principal esker conduits, there are a number of columns or 'tors' about 1.5 m high (Fig. 26). These remnants suggest that meltwater in the esker tunnels had sufficient force to erode the marble to that depth, forming 'Nye' channels at the base of the ice. The upstanding remnants suggest that it was easier to erode the marble than overlying glacial ice, implying the presence of relatively cold ice (Nye, 1973).

Small, shallow, disconnected erosional meltwater channels or poorly defined bouldery depressions are found on till surfaces throughout the peninsula. These generally have not cut through the till sheet, and are thus marked by a lag of boulders. They are indicative of patchy, discontinuous meltwater activity at the base of the ice. Their disconnected nature suggests that they mark places where poorly developed englacial meltwater conduits touched the bed of the glacier.

Kames

In the northwest part of the map area (Map 1847A, 1848A), meltwater systems trend northwest. Most ice-contact glaciofluvial features developed in the glacial troughs

Figure 25.

Steep boulder-clad ridges, broad sandy segments, and flanking sand pads typify the Barrow esker, station 3001. The boulder component is composed primarily of gneiss, schist, and marble. Photograph by L.A. Dredge. GSC 1997-043T

Figure 26.

Small 'tors' or columns, with associated runnels on the rock surface, indicate the vertical extent of subglacial meltwater erosion along esker conduits situated over marble bedrock. Photograph by L.A. Dredge. GSC 1997-043TT

transecting the Prince Albert Hills. Although some esker segments begin on inland plains, most developed within the glacial troughs, and conform in orientation to modern-day drainage systems, as well as to main glacial flow directions. Ice-contact deposits include basal deposits of sand and gravel, and lateral kames which probably developed as late ice tongues in the troughs receded. Some hummocky kame gravels were deposited at the headwaters of the Matheson River, in association with small channels and eskers. Minor landforms in the same area include low, bouldery transverse ridges. These deposits mark marginal stillstands on the uplands of the Prince Albert Hills where the ice cover was thin, but ice may still have been flowing as outlet glacier tongues in the troughs.

Other kame deposits are concentrated in the Aua River area (Map 1851A). There, the hummocky kames, which contain ice-wedge polygons about 15 m across, are associated with a network of subaerial and subglacial meltwater channels. This combination of features, together with low marine limit, suggests a late stagnating ice remnant in the area.

Proglacial outwash

Voluminous valley trains and outwash terraces lie within a few of the glacial troughs that cross the Prince Albert Hills (Map 1847A; Fig. 6). Kettled, braided gravelly outwash terraces line the Matheson River valley and more northerly river valleys. During initial deglaciation, when sea level fell from 140 m to 100 m above present, nested, successively lower terraces were incised into the valley trains, and at the same time, sets of outwash fans and deltas prograded out beyond the valleys into the receding sea. Some outwash deltas on the west coast are 40 m thick. They consist of rounded boulder gravel and sand at their proximal ends, and grade laterally to sand. All terraces contain frost cracks or ice-wedge polygons.

The largest glaciofluvial features in the east and south parts of the peninsula terminate in outwash plains and deltas emptying into the sea, or in some cases into short-lived ephemeral glacial lakes for which there are no other traces. Nonstratified, rounded boulder gravels forming terraces, and cobbly fans with kettle depressions up to 10 m deep, are typical features that lie directly above the marine limit. There is commonly an abrupt change in grain size, from large boulders at the head of the outwash delta, to sand and fines in distal areas (e.g. at Haviland Bay). The largest outwash trains on the south and east parts of the peninsula terminate at or directly below the marine limit. Smaller nested deltas below these levels down to about 100 m a.s.l. suggest later proglacial meltwater deposition from ice receding to the interior areas of Melville Peninsula. Small meltwater channels with significantly less extensive deposits of sand and gravel occupy valley bottoms farther inland. These probably formed during final glacial phases. Many of the meltwater deposits lie along former subglacial drainageways that are unrelated to modern valleys, but some follow the present slope of the land and lie adjacent to modern streams.

Regional implications

Glaciofluvial features are rare on southern Melville Peninsula, compared with other parts of the shield, and this suggests that there was less basal meltwater in the ice sheet in this mid-arctic environment than in glaciers farther south (Rothlisberger, 1972; Shreve, 1972). Eskers and related outwash deposits indicate meltwater flow from the peninsula towards the east, west, and south coasts. The more voluminous deposits indicate meltwater flow in the same direction as the main regional ice movement, and are at variance with modern drainageways.

Most meltwater activity seems to have occurred during late full-glacial time, and between the time that Foxe Ice cleared until sea level had dropped to about 100 m. After that time, glacial ice was either gone or was sublimating.

Forms related to regotill

Glaciofluvial forms in regotill are somewhat different from those in the regular till sheet. There are no eskers, and outwash is limited to the bottom of the Ajaqutalik River valley, where it is composed of gravelly, cobbly sand. Most of the glaciofluvial features are erosional forms, and are of several types: ice-marginal channels, deep rock-cut channels, scour zones on bedrock, diffuse washed zones on till, and small ephemeral drainageways. All are thought to be associated with late melt phases.

Ice-marginal and/or submarginal channels

Side-hill channels are prevalent along the broad slopes of the Ajaqutalik River valley (Map 1849A), and on the north side of Hurd plateau (Map 1850A). They occur as nested, one-sided and two-sided, shallow channels in subparallel arrangements (Fig. 12, 27). More than 25 individual drainageways are nested on some slopes, but are traceable as individual channels for less than 1 km. Channels run slightly oblique to contours, and indicate runoff mainly towards the east in the Ajaqutalik River valley and west north of Hurd plateau. Typical channels are a few metres wide, and are commonly about 1–3 m deep. A few are cut into rock, but most are in bouldery ablation till. At the heads of channels, the material consists of a lag of the coarse fraction of till or regolith; at their distal ends, the channels contain shallow deposits of accumulated cobble and pebble gravel. The upper channels in any given set have indications of higher meltwater energy levels than lower channels. The pattern of channels suggests that they developed during the late stages of glaciation, when meltwater flowed along the sides of valley ice lobes in areas where residual ice caps were downwasting and backwasting.

Provided that the channels are ice-marginal, rather than submarginal, the gradient of the channels suggests an ice slope in the order of 20 m/km near the front of these valley lobes. It has been argued that long, continuous side-hill channels with low gradients (1:50–1:200), similar to those on Melville Peninsula, are characteristic of ice-marginal channels in a cold-ice thermal regime (Sissons, 1961; Dyke, 1993).

Rock-cut channels

Channels with flat-floored cross-sections, deeply and steeply incised into bedrock for up to 20–50 m, begin abruptly on some hill crests on the central Melville plateau. They begin on divides, and terminate in shallow gravelly fan deposits (Fig. 12). The largest channel of this sort is 8 km long, but most are about 2–2.5 km in length, and 30–60 m wide. Widths are generally uniform throughout their lengths (Fig. 28). The rocks in the channel bottom are abraded, partly rounded cobbles and boulders of mixed lithology, derived from regotill. Sizes range from about 15 cm to 2 m; there are no fines. The boulder mass is several metres thick. These deeply incised channels occur in the same geographic areas as side-hill channels, and some feed into, or grade into the upper levels of ice-marginal valley meltwater systems, which suggests that a geographic and time relationship exists between the two types of landforms. In contrast, Kleman and Bergstrom (1990) suggested that this type of feature was relict from a prior drainage system.

Scour patches and drain-back scars

Patches of solid bedrock of irregular shape occur amidst the boulder fields and broken rock on the central Melville plateau. The largest are about 200 m across. In some of these, the bedrock is bare of till, while in others, the rock surface is littered by scattered, rounded boulders. There are occasional P-forms on the scoured rock surface. These zones begin and end abruptly, and are thought to be the result of subglacial moulin-type scour features associated with very late ablation of the plateau glacier. Some have been eroded more than 3 m into the till sheet and regolith. In association with these bare patches are shallow, arcing, disjunct drainageways characterized by a lag of bouldery till.

Zones of washed till

There are more extensive areas of regotill where the surface has been washed, leaving an armour of angular till boulders in some places, but with slightly waterworked, abraded boulders in others. The finer fractions of the till have been

Figure 27.

Nested shallow, subparallel, meltwater channels cut into regotill, station 3132. Photograph by L.A. Dredge. GSC 1997-043SS

Figure 28.

Bouldery floor of subglacial meltwater channel cut into bedrock, station 3131, looking towards the head of the channel. Photograph by L.A. Dredge. GSC 1997-043U

removed, so that there are no mud boils in the washed areas (Fig. 29). Within these areas are upstanding 'islands' of unmodified, mud boiled regotill (Fig. 17). The depth of consolidation by meltwater, as indicated by the 'islands' may have been up to several metres; however, boulders are generally stacked only four or five deep, suggesting removal of much less material. Theoretically, terrain of this type could result from subglacial sheetflow erosion (Weertman, 1964, 1966, 1972); however, since the regotill is bouldery, and hence has a high surface roughness, it is more likely that this terrain formed by widespread melting at the base of the ice sheet during the last phases of glaciation. Drainage of basal meltwater by infiltration and nonchannellized flow might be expected to prevail on the plateaus, where relief is very low, and the regolith is coarse and permeable.

In some places meltwater has been more channellized, forming broad shallow, bouldery swaths up to 30 m wide with sides several metres deep. Boulders in these waterways are slightly more rounded than the till, and are commonly in the order of 50 cm diameter. All fines have been removed. They form tightly packed, open-work structures. These deposits are several boulders deep, and terminate with depth in angular washed till blocks. The rounding of boulders in these waterways suggests that there has been some transport and abrasion of coarse material. Since the channels do not form systematic drainage paths, or show textural gradations along their length, they are thought to be subglacial.

Additional smaller types of meltwater features occurring on the plateau are shallow, narrow, ephemeral meltwater courses about 50–60 m wide with distinctive megaripples or transverse bars. The bottom of the drainageways is a washed till lag. The riffles or bars are regularly spaced about 30–60 m apart, and are about 1 m high; the calibre of the clasts, which are subangular to subround, is about 60 cm to 1 m in diameter. Shallow, subaerial streams do not have sufficient power to create these bedforms; therefore they are postulated provisionally to have a subglacial origin. Some of them link into segments of dendritic systems of shallow modern stream channels, others do not.

Ice-block depressions

Melt-out depressions lie on the west side of the central Melville plateau where regotill is thickest (Map 1848A). These features mark the location of remnant ice blocks. Although the till along the sides of the depressions are boulder armoured (washed), till surfaces in the vicinity retain a matrix, and have mud boils (Fig. 30). Other features of unknown origin in the same area, possibly related to meltwater in extensive crevasse networks in the disintegrating ice cap, are discussed under 'Permafrost conditions and periglacial processes'.

Meltwater features and their genesis

In regotill areas of the central Melville plateau and the Hurd plateau, the general absence of glaciofluvial deposits is an indication that there was little meltwater in the ice. This is in keeping with other landforms and regotill, which suggests that ice in these areas was cold-based. Nevertheless, there is a considerable number and variety of forms relating to meltwater activity. Rock-cut channels, and terrain with nonchannellized flow definitely require warm-based ice. Moulin scours could have developed in warm-ice conditions, or in cold ice if there were fractures in the ice. Ice-marginal channels, and small scars emanating from scoured patches of bare rock, indicate freeze-back conditions and are in keeping with cold ice. Several scenarios could account for the combination of features: 1) there were warm patches in the generally cold-based ice mass, particularly on hillslopes, where there was convergent ice flow; 2) the ice was warm at the base due to its thickness, although the main ice mass above was cold ice due to the polar climate: in this situation there would be few englacial meltwater conduits; or 3) there was a change in conditions over the course of glaciation, with plateau ice becoming warm-based in its terminal phases. The last idea is preferred because it best fits with all the till and landscape features in the region. The absence of ablation till and depositional glaciofluvial forms suggests that there was little

Figure 29.

An armour of angular boulders in open-work array marks an extensive area where basal meltwater infiltrated into regotill and removed the fine-grained matrix, station 3117. Photograph by L.A. Dredge. GSC 1997-043AA

englacial debris in the cold-based ice sheet: ice on the central Melville and Hurd plateaus probably remained cold-based until final melting.

Glaciolacustrine deposits and landforms (unit 9)

Glaciolacustrine sediments are limited to the upper Ajaqutalik River valley and to lands directly above Miertsching Lake. Bouldery areas of washed till, sand veneer, and small sandy deltas along an esker mark the location of a small glacial lake in the headwaters of the Ajaqutalik River. Somewhat more extensive areas of washed till and lacustrine deposits of sand and silt, together with shoreline features in the form of zones of bare rock, gravelly beaches, and small sand deltas at the end of meltwater channels, mark the location of three successive proglacial lakes above, and upstream from, present-day Souter Lake, at elevations of 340 m, 300 m, and 280 m. The lowest level correlates with levels in adjacent areas on northern Melville Peninsula (Dredge, 1995a).

Sand terraces and frost-cracked sand pads above Miertsching Lake indicate that levels once stood about 40 m above present, although there are no extensive associated lacustrine deposits.

Marine deposits and landforms (units 10–13)

About 15% (6000 km^2) of the map area was inundated by late glacial and postglacial seas. All of Rae Isthmus was inundated. On the east and west sides of the peninsula, marine deposits cover a coastal strip between 5 km and 10 km wide, and extend from present sea level up to an elevation of 140–150 m (Fig. 31). In the southernmost parts of the peninsula, marine deposits cover a broader area, and reach an elevation as high as 173 m at Gore Bay.

As the sea receded to its present level, marine processes reworked, transported, and redeposited glacial material. In areas of postglacial marine submergence where wave erosion has been intense, particularly west and east of Lyon Inlet, north of Repulse Bay, and south of Committee Bay, glacial debris and striations have been totally removed, leaving extensive areas of bare rock. Marine deposits are common elsewhere, and they have been separated into classes according to genetic and compositional differences: glaciomarine deposits, thick offshore and sublittoral sediments and veneers, deltas, and coarse littoral gravels.

Glaciomarine deposits (unit 10)

Reworked till

Glaciomarine deposits cover about 3% of the area (1200 km^2). Three types of deposits have been lumped into this unit. The first is a stony silt that covers limited areas adjacent to regotill in the vicinity of Lyon Inlet and Aua River. This is thought to be basically till, slightly reworked by marine processes shortly after deglaciation. Clasts are mainly subangular to subrounded, and are derived from till. Most clasts are of granite and gneiss, although some marble clasts are also present. Carbonate content of the matrix ranges from 0 to 8%, and is thought to be derived solely from the marble sources; there are no limestone clasts.

Rae Isthmus deposits

The second type of deposit covers much of Rae Isthmus below the maximum limit of postglacial marine submergence. The surface material here is typically fine textured, but contains substantial quantities of stones. Many of the clasts are limestone pebbles (16–55%) that are striated and subangular to subrounded. The matrix, composed largely of silt and clay, contains shell fragments in some places. Carbonate contents range from 14% to 18% of the matrix weight.

Because of the scarcity of river exposures, the origin of this material is unclear; most observations are from shallow pits dug into mud boils. In some places the material appears to be a hybrid unit composed of calcareous limestone-derived till and postglacial marine deposits. Where the marine deposits are thin, frost churning has admixed the two materials. Two exposures (site 2419 at Repulse Bay and site 2440 at Lefroy Bay), however, show a true stony marine unit of calcareous (22%

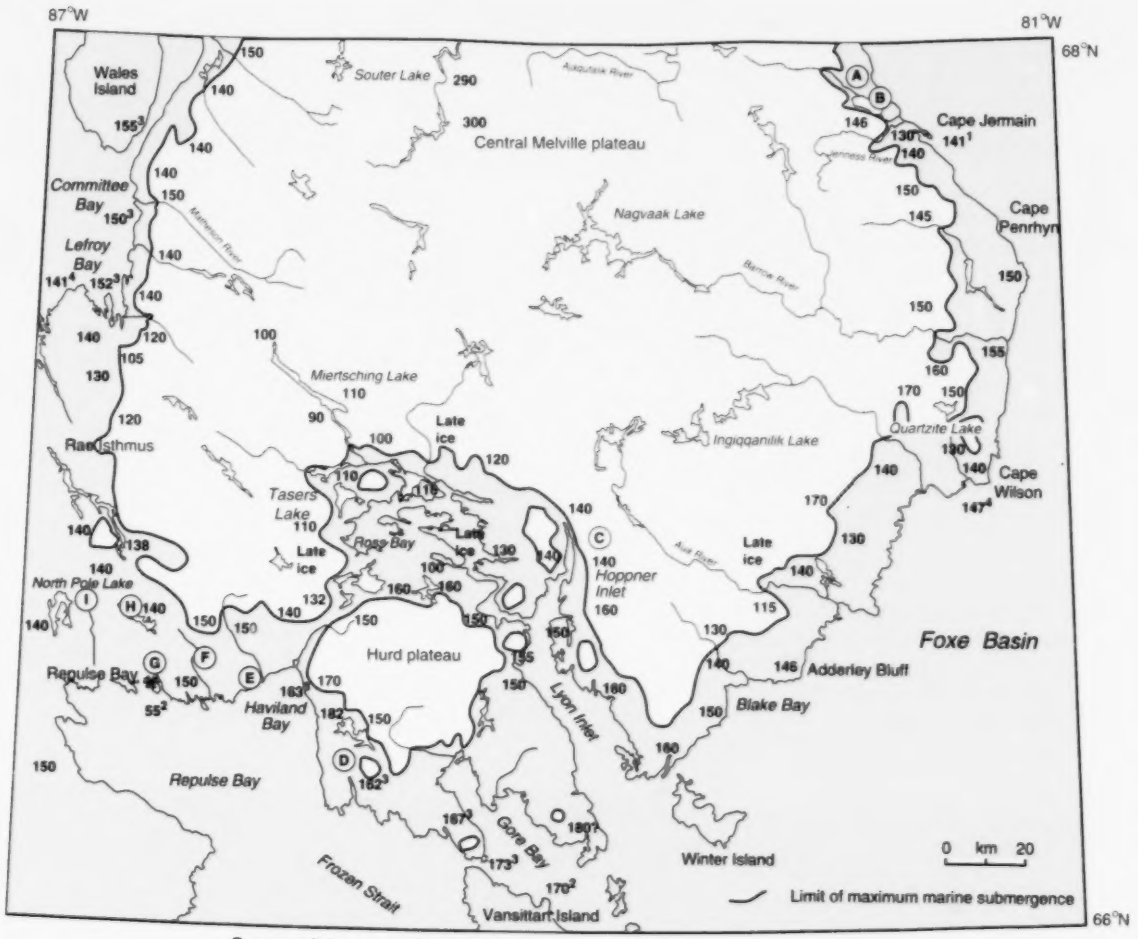
Figure 30.

Large ice-block depression (surrounded by snowbank), and inset kettle pond in an area of downwasting at the western edge of the ice cap on the central Melville plateau, station 2346. Sides of the depression are boulder armoured, foreground is regotill. Photograph by L.A. Dredge. GSC 1997-043L

carbonate) gritty clay underlying marine sand. It is probable that some of the surface materials are also true glaciomarine deposits related to recession of the Foxe Ice sheet.

Melville Moraine

Glaciomarine sediments are exposed in sections along the Melville Moraine (Fig. 6; Map 1847A). A distinctive moraine on the western side of northern Melville Peninsula was identified and described by Sim (1960b), Craig (1965a, b), and in more detail by Dredge (1990). In northern Melville Peninsula it forms a prominent ridge of till and glaciomarine sediments on the western flank of the Prince Albert Hills. The moraine extends southwards into this map area for about 50 km along the west side of the peninsula and into Lefroy Bay south of Matheson River. Although the moraine is composed mainly of till on northern Melville Peninsula, on southern Melville Peninsula the moraine is cored with glaciomarine sediments and lies at an elevation of less than 60 m. Because it is covered by marine deposits, it is shown as a symbol, rather than as a material unit, on the maps.



– Superscripts on numbers indicate:
1. Burns & Wilson (1952)
2. Mattiassen (1933)
3. Sim (1960a)
4. Craig (1965a)

– Other numbers are from this report

Figure 31. *The extent of postglacial submergence, with marine limit elevations in metres. Circled letters indicate radiocarbon dated sites from Table 2.*

The moraine is continuous over long distances, and is slightly sinuous. In a number of places there are multiple ridge crests, each about 100 m wide. In places, spurs extend inland from the main ridge and may mark edges of late minor lobes or radial crevasses in the ice front. Deposits are up to 30 m thick. On southern Melville Peninsula, several sections along the Matheson River and more northerly rivers show that the moraine is cored by bouldery sand or silty sand, either in massive units, or as foreset beds (Fig. 32). Like till, the material is nonfossiliferous and noncalcareous. Many boulders and cobbles are abraded and rounded, however, indicating that they were tumbled by subglacial meltwater prior to deposition. These glaciomarine deposits mark an almost stationary ice front where glacial debris was dumped into a high postglacial sea. Where meltwater conduits in the glaciers discharged into the sea, the moraine consists of bouldery subaquatic deltas lacking topsets. The deltaic unit grades distally into deep-water marine sediments, and where outwash emptied into a regressing sea, upwards into the stratified sand and gravel forsets and cross-stratified delta topsets that make up unit 11. In other places, the glaciomarine sediments of the moraine are overlain by a marine regression sequence consisting of marine silt which is sparsely fossiliferous, and unconformable deposits of littoral sand or sand and gravel. Beyond outwash deltas, the surface of the moraine is commonly mantled by a dense lag of boulders at its crest, and flights of sand and gravel beaches with frost cracks and ice wedges on the slopes. Although there are no radiocarbon dates on the moraine in southern Melville Peninsula, fossils within the diamicton at Corrigal River, Baker Bay, Barnston Point, and Selkirk Bay directly to the north (Dredge, 1995a) gave radiocarbon dates of 6830 – 130 BP (GSC-4583), 6810 – 80 BP (GSC-4225), 6150 – 90 BP (GSC-4857), and 6450 – 70 BP (GSC-4786), respectively, thus bracketing the age of the Melville Moraine. These dates are comparable to deglacial dates of about 6.8 ka BP on Rae Isthmus (Table 2).

The moraine is believed to mark an ice front standing in the sea, fed by ice which was fast flowing to compensate for calving into the high postglacial sea that occupied Committee Bay during deglaciation. The marine incursion began about 6.8 ka BP in this area, and ice remained at the Melville Moraine until 6.4 ka BP or 6.1 ka BP.

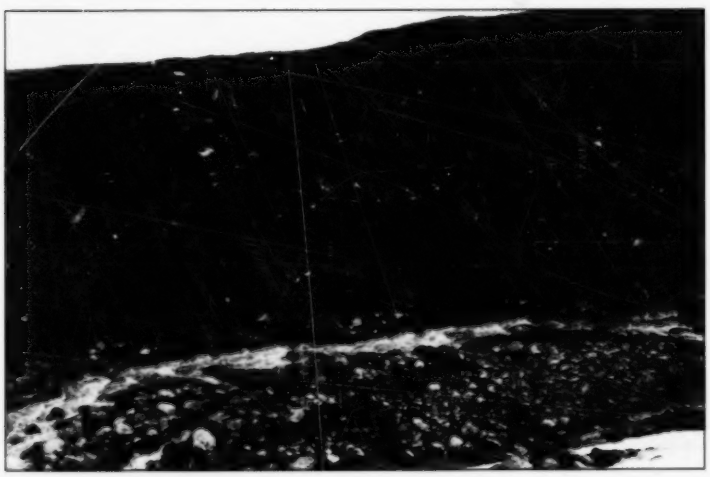


Figure 32.

Section through the Melville Moraine north of Matheson River, station 2409, showing substratified sands and abraded boulders in the lower part of the exposure. Beaches formed on the surface of the deposit during the postglacial marine regression. Photograph by L.A. Dredge. GSC 1997-043S

Table 2. Radiocarbon dates used to construct glacial history and sea-level changes.

Site (Fig. 31)	Site number	Latitude (N)	Longitude (W)	Lab number	Date corrected to δ^{13} of 0.0 ppt	δ^{13}C (ppt)	Date uncorrected	Elevation (m)	Material
A	88DU-1808	66°55.2′	82°18.7′	GSC-4812	6170 - 80 BP	+1.5	6150 - 80 BP	104	Shells
B	–	67°51.3′	82°09.9′	GSC-291	–	–	6880 - 180 BP	134	Shells
	88DU-1810	67°51.3′	82°09.9′	GSC-4750	6420 - 90 BP	+1.4	6400 - 90 BP	141	Shells
C	90DU-2014	66°49.5′	83°47.9′	GSC-5112	6490 - 140 BP	+1.5	6490 - 140 BP	125	Shells
D	90DU-2598	66°23.2′	85°10.7′	GSC-5132	6920 - 100 BP	+1.5	6890 - 100 BP	100	Shells
E	90DU-2454	66°33.7′	85°38.0′	GSC-5172	3020 - 80 BP	+1.5	2990 - 80 BP	12	Shells
F	90DU-2419	66°35.7′	86°01.7′	GSC-5166	6530 - 80 BP	+2.0	6500 - 80 BP	75	Shells
G	90DU-2321	66°33.3′	86°14.9′	GSC-5146	6760 - 100 BP	1.2	6740 - 100 BP	80	Shells
H	–	66°44.0′	86°42.0′	GSC-286	–	–	6850 - 140 BP	121	Shells
I	90DU-2024	66°43.5′	86°38.8′	GSC-5110	6500 - 120 BP	+1.5	6480 - 120 BP	105	Shells

– No data available

Marine cover deposits and veneers (unit 11)

Landforms

Offshore and sublittoral sediments have been subdivided into thin veneer and thick blanket deposits. Veneers are less than 1 m thick, and overlie either bedrock or till. Blanket deposits are generally 1–5 m thick, but attain thicknesses of up to 10 m on Rae Isthmus, and up to 20 m along the northwest coast.

Extensive marine blankets lie on the coastal plain along the northeast and northwest coasts, on Wales Island and Winter Island, and north of Haviland Bay. Small beach ridges composed of sand and gravel give minor relief to the surface. Most surfaces have a thick, grassy-meadow vegetation. Shallow ponds are common features and are prevalent on Winter Island and Wales Island. Small, elongate ponds occupy depressions between beach berms, whereas larger, more irregularly shaped ponds cover areas that are poorly drained due to a clayey substrate or bedrock at shallow depths. Many ponds on Wales Island are thermokarst features. Frost polygons have developed on some surfaces where the marine deposits are sandy, and small, silty mud boils about 60–70 cm across are present where deposits are finer.

Texture and composition

Marine sediments are exposed in sections along the Jenness River and Matheson River, on Wales Island, southern Rae Isthmus, and north of Haviland Bay. The sections generally show a marine regressive sequence of silty clay at the base, in places fossiliferous, coarsening upwards to stratified sand in planar beds or to massive sand and gravel.

Although there is a substantial variation in texture from one place to another, on average, surface marine deposits consist of slightly less sand, and correspondingly more silt and clay than their glacial source materials (Fig. 18). Major sand deposits are located north of Cape Penrhyn, at Haviland Bay, northern Rae Isthmus, and Winter Island while major silt units are located on southern Rae Isthmus, along Frozen Strait, north of Barrow River, and on parts of Wales Island. In general, sediments at higher elevations are slightly coarser than those near present sea level, and in places are composed of stony, modified till with the fine fraction winnowed out. These deposits tend to form thin veneers west of Ross Bay and north of Winter Island.

The texture and lithic character of marine deposits varies according to their proximity to outwash corridors that transported glacial materials into the sea, to the character of primary glacial source materials, and to underlying rock types. In the northeast and northwest, where outwash corridors transported vast quantities of sediment into high-level seas, marine deposits consist generally of stratified sand, or sand with rounded pebble gravel, whereas in areas farther from sediment influxes, stone-free silt is common. Where marine deposits were derived primarily from glacial debris generated by ice originating on Melville Peninsula, both the fine fraction and pebble components are noncalcareous. Although areas between Cape Penrhyn and Cape Jermain, and along Hoppner Inlet, are underlain by limestone outcrop, the marine blanket deposits are composed of reworked peninsular till: there is little carbonate in the fine fraction, and less than 10% of the pebbles are limestone.

Marine deposits tend to be silty and contain limestone pebbles where materials are derived from till emplaced from an ice centre in Foxe Basin. Silty mud boils containing some stones underlie Rae Isthmus (Fig. 33), along Frozen Strait, and on Winter Island. Silty deposits associated with limestone source areas are also common on the east side of the peninsula between Cape Penrhyn and Cape Wilson. Carbonate content in the silt-clay fraction in these areas ranges between 0 and 70% and in the pebble fraction between 0 and 60% (Fig. 21–23). Limestone pebbles in marine deposits tend to be rounded, although they are subangular to subrounded and striated in the underlying till. The presence of limestone in both till and marine deposits along the east coast, but not in the till 5–10 km inland, suggests that ice carrying carbonate rocks from Foxe Basin impinged on part of the coast but did not reach far inland.

Figure 33.

Calcareous, silty marine deposits with mud boils near Repulse Bay, station 2321. Photograph by L.A. Dredge. GSC 1997-043P

Wales Island, which is underlain by limestone and dolomitic bedrock, has some blanket deposits composed of clayey silt, that range from 30% to 90% carbonate. Where the substrate is sand and gravel, between 70% and 100% of the pebble fraction is limestone. In contrast, adjacent areas on the mainland have less than 10% carbonate pebbles.

Deltaic deposits (unit 12)

Large deltas are much more common on southern Melville Peninsula than on northern Melville Peninsula. The largest and most extensive deltas lie at or just below the maximum limit of marine submergence, but smaller features of similar character are present at lower elevations, where gradually lessening amounts of outwash sediment from the retreating ice sheets contined to be deposited into the receding sea. Large, massive deltas are most common in the northwest (Matheson River area; Fig. 6) and the northeast parts of the map area, and along Hoppner Inlet in the south. Kettle holes and anastomosing channels in bouldery gravel are present on some surfaces at marine limit where the glacier was in close proximity to the sea. Most deltas, however, developed where proglacial outwash was deposited into the sea.

Typically the deltas consist of coarse, cobbly material near the apex, and grade distally into foresets or planar beds of sand and silt, and then to sandy silt. The largest deltas are 30–40 m thick and have coarsening-upward sediment sequences consisting of beach sand and gravel unconformably overlying sandy foresets. Small deltas at low elevations, shown by symbols on the maps, tend to have sandy surfaces and grade to silt and clay at depth.

Coarse-grained (bouldery and flaggy) littoral deposits (unit 13)

Coarse-grained littoral deposits developed where there were stretches of open water (not perennial sea ice) in postglacial time, and where the slope of the land was sufficient for high-energy waves to impinge on the coast during storms.

The raised beaches on Wales Island are composed dominantly of broken, platy limestone flags, many of which at the surface are pitted by solution weathering. Fights of beaches extend from limestone buttes that form the central spine of the island down to sea level. The ridges are commonly 2–4 m high, up to 10 m wide, and consist of limestone flags or angular fist-sized lenticular limestone cobbles, along with occasional rounded ice-rafted granitic boulders. They occur both as continuous stepped flights of beaches (Fig. 34) and as individual ridges separated by swales or broad, level areas dotted with shallow tundra ponds. They are more widely spaced near the present coast than at higher elevations. In contrast, along the adjacent shores of Melville Peninsula, raised beaches, composed of sand and granitic cobble gravel, are less common. This difference suggests that Wales Island was surrounded by open water, while the coast of the peninsula was protected by shore-fast ice. Some boulder beaches do exist along the Committee Bay coast of Melville Peninsula, but the bouldery areas are actually washed remnants of the Melville Moraine rather than being marine constructional landforms.

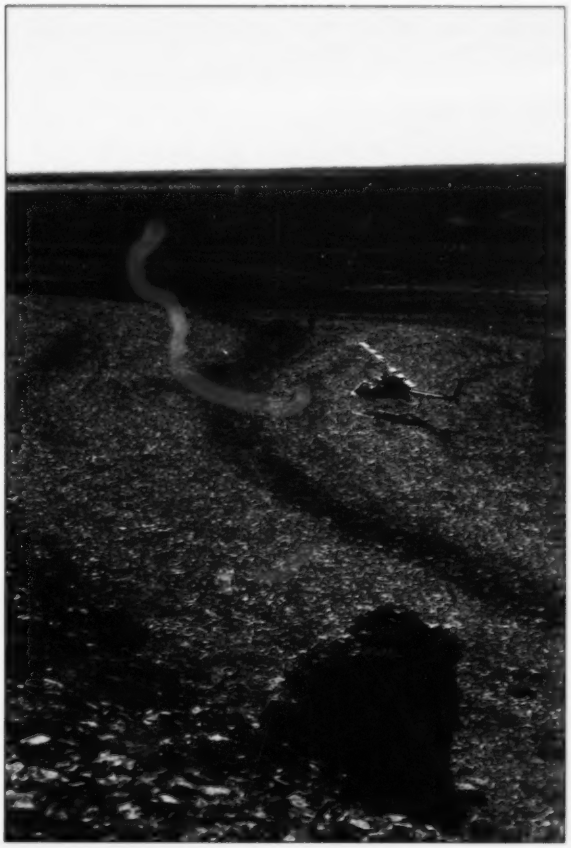


Figure 34. *Flights of beaches composed of limestone plates, Wales Island, station 3468. Photograph by L.A. Dredge. GSC 1997-043A*

Flights of boulder beaches composed of rounded granitic gravel (Fig. 35) are prominent features along the east coast at Adderley Bluff and north of Cape Penrhyn. Flaggy strandlines are also common north of Cape Jermain, and along parts of Hoppner Inlet, where the bedrock underlying lowlands is limestone. Typically, in these situations, the highest beaches consist of rounded granite boulders, which become cobble gravel lower down. With decreasing elevation, limestone content increases until the lowest beaches are mainly limestone flags and rounded limestone cobble gravel.

Emerged offshore bars 5–6 m wide form low gravel berms with sandy or silty foreshore areas around Winter Island, Lyon Inlet, and the lowlands west of Blake Bay (Map 1851A).

Other features related to raised marine units

Trimlines

Trimlines, characterized by an abrupt change from unmodified till to bare, heavily washed rock, are conspicuous features around Haviland Bay, Rae Isthmus, and the escarpment at the edge of the uplands along Lyon and Hoppner inlets

(Fig. 36). Trimlines are traceable for considerable distances on the airphotos. Their breadth and vertical extent depend on local terrain geometry. They are characteristically 6–11 m wide. The highest trimlines correspond in elevation to the upper limit of raised deltas and beach ridges. The features are thought to have developed in areas exposed to open seas at the time of deglaciation, where wave action could remove the till.

Marine limit

The marine limit varies in age and elevation from place to place (Fig. 31). The marine limit was determined by the elevation of ice-contact deltas, other high-level deltas, the highest raised beaches, trimlines, fossil sites, and occasionally (Sim, 1960a), by the lower limit of perched boulders.

Marine limits range from 140–150 m around Committee Bay, and are generally much lower than on northern Melville Peninsula, where they reach 220 m (Dredge, 1995a). Marine limit elevations remain more or less constant southward along Rae Isthmus, but climb to 170–180 m at Frozen Strait. Along the east side of the peninsula, elevations are commonly in the range of 140–150 m, similar to the west coast, although it lowers to less than 130 m in the Aua River area. Marine limit also declines systematically inland from the outer part of Lyon Inlet to around 100 m in the Ross Bay area. In this case the marine limit is probably low because the area was not deglaciated until sea levels had dropped.

Fossils and radiocarbon dates

Fossiliferous marine deposits are common on the south coast of the peninsula and on Rae Isthmus. Marine shells, especially the species *Hiatella arctica*, *Mya truncata*, *Macoma calcarea*, and *Balanus* sp., are the principal fossil types. No whale bones were found. Where they exist, the shells were found in small quantities and are thin, chalky, fragments that lie on the surfaces of mud boils. In situ shells are scarce, and none were found around Committee Bay. In several sections where shells were collected for dating, intact bivalves were found in nearshore sediments, so that a probable sea level

Figure 35.

Flights of rounded granitic cobbles near Cape Wilson, station 3006, attest to high-energy marine processes. Background shows lowland marine plains with blanket sands. Photograph by L.A. Dredge. GSC 1997-043W

Figure 36.

Marine limit trimline east of Lyon Inlet, station 2013, showing an upper surface of unmodified till and lower area where the rock surface has been swept bare by waves. Large solifluction lobes have developed along the edge of the till surface since deglaciation, about 6500 years ago. Photograph by L.A. Dredge. GSC 1997-043F

could be assigned to the fossil age. In most places, however, shells were in material that could not be directly related to a specific water level.

Intact bivalves and whole single valves in small deltas at eight sites were dated (Table 2) to determine the time of deglaciation and sea-level changes. The shells from deltas have fairly low d13C values, suggesting that they lived in brackish water. The GSC lab does not apply a "reservoir factor". Because of the low d13 values, the "corrected" GSC shell dates are roughly comparable to those reported from other labs which are computed to d13 = -25 ppt where a -400 year reservoir correction has been applied. Note that there are unexplained discrepancies in the dates of shells collected by Craig (1965b), and new dates from the same populations reported by Dredge in this bulletin, with Craig's dates being up to 400 years older. North of Repulse Bay, sample GSC-5110 was collected from the same site as Craig's GSC-286, but yielded a different age, as did a recent redating (GSC 286/2) of the shells from Craig's original sample. There was a similar discrepancy in apparent ages between GSC-291 and GSC-4750 from the same site in the northeast part of the map area.

The ages of high-level shells range from 7 ka BP to 6.5 ka BP, but the sample from Frozen Strait was well below the marine limit, which suggests that the strait may have been deglaciated earlier than 6.9 ka BP. The Rae Isthmus dates and those on the east coast suggest that the east and west coasts were deglaciated at about the same time. The dates indicate that Foxe Basin opened from the south, and that southern Committee Bay and the east coast were both deglaciated slightly later. The dates are similar to those at Garry Bay and Selkirk Bay on the Committee Bay coast on the northern part of the peninsula, and to those in the Kingora River north of Parry Bay on the east side of the peninsula. They are in sharp contrast, however, to the north part of Committee Bay, which was deglaciated about 9.1 ka BP and has a marine limit of 220 m (Dredge, 1990).

Modern alluvium (unit 14), eolian deposits, and peat

Over most of the map area, there is little sign of significant fluvial erosion and deposition in postglacial time. Most rivers shown on the digital topographic base maps are ephemeral. Mappable areas of modern alluvium are limited to the lower reaches of rivers that have cut through raised deltas. Alluvium, consisting of well sorted sand and gravel, forms low terraces, point bars, and bottom deposits in shallow, braided, and meandering channels.

There are no eolian deposits which are of mappable size in the map area. Thin sheets of eolian sand, interstratified with buried vegetation layers, were seen in some sections across Rae Isthmus, where sand was the main substrate.

Peat deposits are generally limited to parts of Wales Island, and they are less than 15 cm thick.

GLACIAL HISTORY

Ice-flow indicators

A variety of materials and landforms indicate the direction of glacial ice flow, both during full glaciation and during final retreat of the ice sheet. These have been described previously and are shown on the maps accompanying this report. Ice-flow indicators include: 1) striae and ice-moulded glacial erosion bedforms, including roches moutonneés, crag-and-tail forms, and drumlins (Fig. 37); 2) aspects of till composition, including erratic boulders of distinctive provenance, and carbonate dispersal trains which separate out areas of ice originating on Melville Peninsula from areas affected by ice flow from Foxe Basin; and 3) eskers and meltwater channels, which indicate hydraulic gradients and ice-margin positions.

The relative ages of indicators were determined by cross-cutting relationships for erosional forms, and by the superposition of deposits. As well as indicating ice-flow directions, these features also give information on the style of ice flow and the distance of transport. Most ice-flow indicators suggest that glaciers originated on the peninsula, and that flow from peninsular ice domes or divides persisted throughout the last glaciation on southern Melville Peninsula, in contrast with northern Melville Peninsula, where ice flow was controlled by a major dispersal centre in Foxe Basin.

Early glaciation(s) from Foxe Basin

Widely scattered limestone boulders and pebbles (Fig. 21) in till on north-central parts of the map region indicate that ice from Foxe Basin covered at least the eastern half of southern Melville Peninsula at some time, and a limestone boulder at site 2277 in the Prince Albert Hills near Committee Bay suggest that Foxe Ice may have extended much farther west. Despite the sporadic occurrence of limestone boulders and pebbles inland, there are negligible amounts of carbonate in the till matrix over most of the area, especially when carbonate concentrations are compared with those on northern Melville Peninsula: areas of northern Melville Peninsula that were crossed by carbonate-bearing ice from Foxe Basin during the last glaciation have matrix carbonate contents greater than 20–80%. It is possible that any carbonate from the till matrix associated with the glaciation that left the scattered inland boulders on southern Melville Peninsula has been weathered out and removed from the till.

The timing of the limestone-emplacing glacial event is unknown, but due to the absence or low concentration of matrix carbonate, and the presence of extensive areas of incoherent rock and weathered regolith that would have been eroded away if active, till-depositing ice covered the area during the last glaciation (cf. northern Melville Peninsula); this glaciation probably predates the Sangamon interglaciation.

Evidence for another, regional, possible inflow of Foxe Ice onto the mainland is confined to the northeast part of the map region, and is inferred by higher concentrations of limestone pebbles in the till in some places. This event could be a recessional substage of the glaciation generating widespread

Foxe Ice on the peninsula; it could also be a separate event that predates the time of development of weathered regolith; or it could be an early phase of the last (Foxe) glaciation.

Interglaciation and weathering

Although it is believed that the entire area was ice covered during the last glaciation (Wisconsin Glaciation–Foxe Glaciation), remnants of weathered regolith are present over much of the area mapped as broken rock and regotill (units 1, 2, and 3). It is thought that the weathered material was preserved beneath areas covered by ice that was nonerosive, either because the ice was cold based, or because it lay beneath ice divides. In these areas, rock has more deeply weathered surfaces than those with landforms indicative of glacial erosion and deposition, with many bedrock surfaces and boulders in till being weathered to gruss. Sand- and silt-sized material, seen in mud boils, is more deeply hued than in other areas, and clay minerals are more prevalent. These characteristics suggest that a relatively prolonged period of subaerial weathering occurred prior to the last glaciation, and that temperatures may have been warmer than in Holocene postglacial time. The simplest age assignment for this nonglacial event, which is sandwiched between two separate glaciations, is the Sangamon interglaciation.

Last glaciation

Because of the reconnaissance nature of the mapping project, many details on ice-flow sequences and timing are lacking. The following reconstruction of the last glaciation is one of several possible variations, but is thought to best fit the available data.

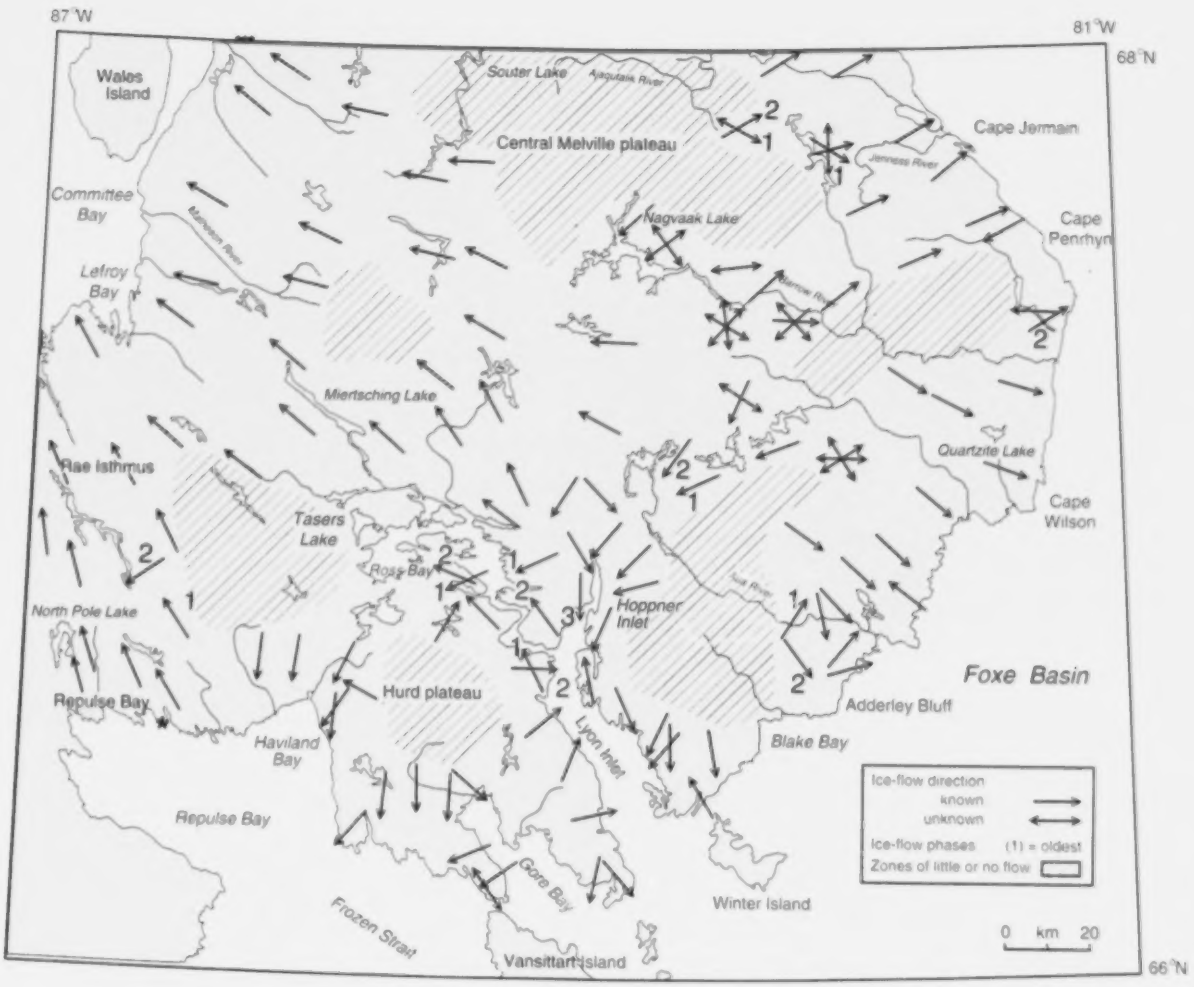


Figure 37. *Ice-flow indicators, summarized from maps 1847A–1851A.*

Early ice buildup: Melville Ice

The composition and texture of till indicative of sources native to southern Melville Peninsula suggest the development of local ice caps. If the style of glaciation was similar to the eastern part of the Foxe–Baffin sector of the Laurentide Ice Sheet, where upland plateaus were the original centres of glaciation (Ives and Andrews, 1963), then the plateaus and eastern parts of Melville Peninsula could have been ice accumulation areas, and centres of early outflow. Local growth centres eventually coalesced to form an ice sheet. Areas of regolith and regotill (Fig. 38A) may delimit areas that were either beneath ice domes or divides, where basal flow would be limited, although crushing could occur (cf. Sugden, 1977; Paterson, 1994), or areas of cold-based ice. The extent of the regolith area suggests that much of the ice cap was cold based, and bonded to the substrate. Surrounding areas of the ice sheet, especially areas away from possible ice divides, were warm based, and show evidence of glacier erosion and deposition of local materials. The zone of eroding ice was about 60 km wide on the west side of the ice sheet, and less than 40 km wide on the east.

Regional topography controlled ice configuration and ice movement during early phases of glaciation, with a coalesced ice sheet with one or more divides developing on high ground, and ice tongues flowing down valleys (Fig. 38B). On the western part of the peninsula, U-shaped troughs with polished sides developed along weathered fractures, in what are now major river valleys. Some of these troughs have orientations that diverge considerably from the later regional ice-flow trend. Another ice tongue flowed southward, down Lyon Inlet. On the eastern part of the peninsula, glaciers exploited weak marble units, preferentially eroding these areas, and creating drumlins within them that are oriented southwest. These features were later overridden by regional ice flowing outwards from the main ice divide (Fig. 38C).

As this glacial phase progressed, ice over the central Melville and Hurd plateaus probably remained cold, and vigourous basal flow continued over the western side of the ice sheet. The position of divides probably shifted in the south and east, slightly remoulding some of the regolith, producing bouldery regotill and some crosscutting striae.

Foxe Ice phase

By the last glacial maximum, an ice divide had built up in Foxe Basin. Its size and thickness indicate that it must have subsumed Melville Ice, as well as Baffin Ice (Andrews and Sim, 1964; Dyke and Prest, 1987), to form a large ice sheet, with the main flow controlled by the thick ice centre in Foxe Basin. The absence of carbonate till on most of southern Melville Peninsula, however, suggests that a subsidiary ice divide, or divides, persisted and blocked the flow of Foxe Basin ice. Calcareous drift shows that ice from Foxe Basin reached as far as the eastern edge of the peninsula in some places, crossed Winter Island, and flowed northward through Rae Isthmus (Fig. 38C). Foxe Ice was driven part way up Lyon Inlet, although the drumlin field (of noncalcareous till) at Miertsching Lake was produced by ice flow controlled by divides on the peninsula. Widespread till and streamlined forms suggest that much of the ice was warm based. Fast flow was probably generated and maintained through Rae Isthmus by convergence of ice from Melville Peninsula, Foxe Basin, and Keewatin Ice Divide, and by poorly drained, deforming bed conditions related to silty till at the base of the ice.

Deglaciation

Ice recession along the coasts

Deglaciation, crustal rebound, and sea-level change are concurrent interrelated events. Deglaciation began with the incursion of high-level seas around the peninsula and destabilization of marine-based ice in Foxe Basin, Foxe Channel, and Committee Bay. Over most of southern Melville Peninsula, ice retreat progressed gradually inland from coastal areas, although deglaciation and accompanying inundation of Rae Isthmus probably occurred rapidly. The pattern of ice retreat on southern Melville Peninsula is markedly different from that on northern Melville Peninsula, where the retreat pattern was from west to east.

Elevations on the marine limit have been used to establish sequences for deglacial events, while radiocarbon dates on marine fossils provide chronological control on the rate and pattern of ice retreat. On northern Melville Peninsula (Dredge, 1995a), radiocarbon dates from sites near marine limit give good chronological control on the timing of deglaciation; in contrast, on southern Melville Peninsula, shells relating to specific water levels are relatively scarce and rarely relate to sites near marine limit. Nevertheless, the available dates, combined with marine limit elevations, provide a framework for determining the sequence and timing of deglaciation events.

Southwest coast

The southernmost part of the area has the highest marine limits, about 170–180 m a.s.l. near Frozen Strait–Winter Island, and also the oldest radiocarbon date (6920 ± 100 BP; GSC-5132), although this date is from a site well below the marine limit. This date, together with the redating of Craig's (1965b) samples north of Repulse Bay, suggests that the south coast was deglaciated and inundated at or before 7000–6900 BP. The marine limits on the south coast are about the same as those of 170 m on Vansittart Island to the south (Mathiassen, 1933), and slightly less than those at 190 m a.s.l. on Southampton Island to the southeast (Bird, 1954, 1970). Since the marine limit is about 30 m lower at Repulse Bay than in Frozen Strait, the time of deglaciation at Repulse Bay may have been slightly later. Rae Isthmus was also deglaciated and inundated by 7000–6800 years ago (*see* below).

East coast and southeast coast

Radiocarbon dates along the east side of southern Melville Peninsula indicate that this shore was deglaciated by 6.8 ka BP (6880 ± 180 BP; GSC-291; Craig, 1965b). The marine incursion may have been slightly later here than farther south.

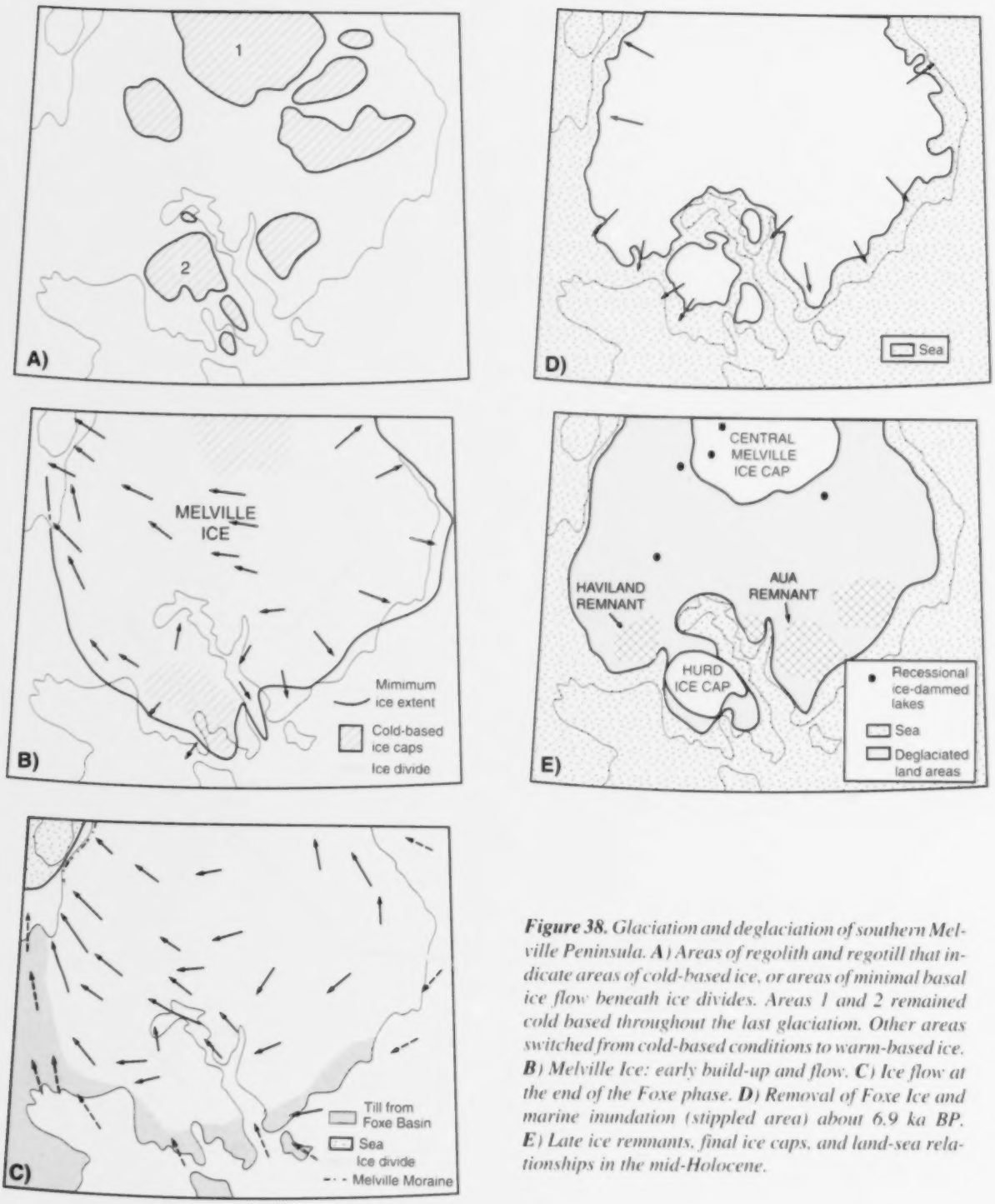


Figure 38. *Glaciation and deglaciation of southern Melville Peninsula.* ***A****) Areas of regolith and regotill that indicate areas of cold-based ice, or areas of minimal basal ice flow beneath ice divides. Areas 1 and 2 remained cold based throughout the last glaciation. Other areas switched from cold-based conditions to warm-based ice.* ***B****) Melville Ice: early build-up and flow.* ***C****) Ice flow at the end of the Foxe phase.* ***D****) Removal of Foxe Ice and marine inundation (stippled area) about 6.9 ka BP.* ***E****) Late ice remnants, final ice caps, and land-sea relationships in the mid-Holocene.*

because the dated site north of Jenness River is near the marine limit of 150 m, whereas the south coast site lies well below marine limit. There is also a date of 6.4 ka BP (6420 – 90 BP; GSC-4750) near marine limit, which would indicate a slower northward removal of ice from Foxe Basin. The opening of Foxe Basin cut off source areas of ice flow over most of northern Melville Peninsula, but had little affect over much of southern Melville Peninsula because ice there was moving outward from centres on the peninsula; however, removal of ice from Foxe Basin would have totally deglaciated those areas of the east coast and Rae Isthmus that were covered by Foxe Ice.

On the east side of the peninsula, coastal areas were ice-free by 6.5 ka BP except in the vicinity of Aua River. There, hummocky till and low marine limits of about 130 m a.s.l. suggest that there were late ice remnants (Fig. 38E).

Marine inundation and deglaciation proceeded northwards in Lyon Inlet. A date of 6490 – 140 BP (GSC-5112) in a marine limit delta at 130 m a.s.l. in Hoppner Inlet indicates an incursion of the sea up Lyon Inlet over a period of about 400 years, and that sea level had dropped since deglaciation of the outer part of the Inlet. The inner part of Ross Bay was not deglaciated until sea level had fallen to about 100 m a.s.l. Similarly, on a more local scale, marine limits along the coasts decline landwards from valley mouths. This indicates that there was gradual ice retreat inland on most of southern Melville Peninsula.

Committee Bay and Rae Isthmus

No dates were obtained from the Committee Bay area of southern Melville Peninsula. Dyke and Prest (1987) showed that open water lay north of Melville Peninsula as early as 9.6 ka BP. Prior to the onset of deglaciation, strong ice flow through Fury and Hecla Strait had driven Foxe Ice to at least 86°W and 70°N, where it may have terminated in open water. A marine re-entrant had developed at the north end of Committee Bay by about 9.1 ka BP (Dredge, 1995a), and had reached the latitude of Wales Island (68°N) by 8.6 ka BP (Craig, 1965b). The re-entrant probably penetrated at least as far south as 67°30'N (Map 1847A), where the last traces of the Melville Moraine are seen. The ice front may have gradually progressed southward onto the area of Rae Isthmus, or have lingered just south of Matheson River. The marine re-entrant acted as a glacial calving bay and promoted fast glacier flow through Rae Isthmus, accentuating the already existing fast flow generated by converging ice masses.

The calving ice front may either have retreated from north to south across the isthmus between about 8.4 ka BP and 6.8 ka BP, or else the area of Rae Isthmus was deglaciated and inundated suddenly at about 6.8 ka BP, when the ice mass in Foxe Basin destabilized. The consistency of marine limit elevations at about 150 m across Rae Isthmus suggests the latter.

Melville Moraine and west coast

The Melville Moraine formed between 8.4 ka BP and 6.8 ka BP in parts of northern Melville Peninsula affected by ice flowing out of Foxe Basin, but remained until 6.4–6.1 ka BP farther south in areas affected by the ice cap on the central Melville plateau (Dredge, 1990, 1995a). During the period when ice stood at the moraine, sea level dropped from more than 220 m to less than 140–150 m. From northern Melville Peninsula, the moraine is traceable southwards for another 50 km. Traces of the Melville Moraine end at sea level south of Matheson River. The moraine either terminates here or extends westwards under water. On southern Melville Peninsula the moraine consists of multiple ridges cored with glaciomarine deposits. Fields of streamlined landforms behind the moraine, not found in other parts of the Melville Ice domain, support the idea of fast flow towards a calving ice front. Fast glacier flow would have been required to maintain an equilibrium ice profile at the calving front.

Although there are no dates from shells within the moraine on southern Melville Peninsula, the proximity and similarity to low-lying moraine segments at Selkirk Bay 26 km north of the map area suggest a similar history. As at Selkirk Bay, ice on southern Melville Peninsula probably stayed at the moraine until 6.4–6.1 ka BP, when sea level had fallen to roughly 140 m.

Final recession of Melville Ice

Initial shifts in ice-flow direction

The removal of the ice dome in Foxe Basin and continued opening of Committee Bay about 6.9 ka BP created shifts and readjustments of ice flow on the peninsula. In Lyon and Hoppner inlets there was a reversal in flow from northwards, to flow southwards and into the inlets, as shown by streamlined forms, and the trend of eskers terminating in glaciomarine deltas (Fig. 38D). Major changes in ice flow also occurred along the east coast, with flow becoming coastward. With the penetration of the calving bay in Committee Bay and development of the Melville Moraine on the west coast, regional flow west of Nagvaak Lake shifted from west-northwest to northwest.

Late ice in the Aua River area

In the Aua River area north of Blake Bay, unmodified eskers below regional marine limit and low local marine limit elevations suggest that ice remained in this area after the sea had inundated other parts of the coast (Fig. 38E). The marine limit of about 130 m suggests ice there lasted about 300 years after it withdrew from adjacent areas. Hummocky till and kames delimit the last ice remnants.

Ice retreat onto central upland areas

Most evidence suggests progressive backwasting and frontal recession of ice from coastal areas to the central parts of southern Melville Peninsula. After recession from the Melville Moraine, ice retreated onto the western edge of the uplands, where some ice-front positions are marked by kames and gravel ridges with large ice-wedge polygons. These are the only recessional moraines on the plateau. Till characteristics indicate that ice retreat appears to have been by both thinning and backwasting, with deposition of basal meltout till over much of the peninsula and hummocky ablation till in the northwest. Ice may have become cold-based in these final phases. At this time, outlet glacier tongues continued to flow through the Prince Albert Hills in glacial troughs. Recessional positions of these ice tongues are marked by small moraines and lateral kames. Some of the esker sediment in the valleys may have been deposited during this late glacial phase.

Although eskers are rare, parallel swaths of bare, washed rock up to 20 km long and 1 km wide, containing disconnected esker segments, indicate abundant subglacial meltwater beneath the receding ice sheet. These conduits were broad, but possibly not very high. Net meltwater erosion predominated over glaciofluvial deposition. The location of these channels relative to areas of regotill suggests that they formed where there was rapid melting of formerly cold-based ice that had carried little glacial debris. The parallel arrangement of channels (versus networks) suggests that they formed near the receding ice margin, where the ice-surface slope was steep and the hydraulic gradient was proportionately high. Some of these conduits end in marine-limit deltas, indicating that they formed about 6800–6400 years ago, but others grade into proglacial outwash and deltas that were formed when sea level had dropped to about 100 m, approximately 6000 years ago (GSC-4812). By this time, hydraulic gradients and ice flow were towards the northeast in the Jenness River area. Except in the Prince Albert Hills, the directions of subglacial hydraulic gradients do not coincide with that of modern streams, but rather suggest gradients trending cross-country towards the coasts.

Many of the glacial valleys on the west side of the peninsula are partially filled with gravelly outwash. Downstepped terraces and outwash deltas, particularly along the lower reaches of the Matheson River and the river directly north of it, indicate that abundant proglacial sediment-laden meltwater flowed down these valleys from the time of deglaciation of the coast until sea level had dropped to about 100 m.

A large outwash fan of rounded boulders is associated with an esker conduit on the central landmass north of Haviland Bay. Elsewhere, limited amounts of outwash were deposited along drainageways as ice receded.

Glacial lakes

As the ice margin receded eastwards from the Prince Albert Hills, small glacial lakes developed where drainage was blocked by late ice on the central Melville plateau. The highest lake stood at an elevation of 340 m a.s.l. in the headwaters of the Ajaqutalik River. As the ice cap receded, the lake followed the ice margin eastwards. Levels dropped to 300 m a.s.l. and then 280 m a.s.l. as successive outlets opened. The glacial lakes drained to form the present Souter Lake when the Ajaqutalik River valley became ice-free.

A separate high-level glacial lake developed about 40 m above the current water level of Miertsching Lake. This lake was short-lived, and drained when Ross Bay became ice-free. The existence of another glacial lake in the headwaters of Barrow River is marked by a large delta that was fed from an esker conduit. This lake developed during ice retreat from the east side of the peninsula.

Disintegration of the ice caps

Although most ice disappeared by the mid-Holocene, the ice caps on Hurd peninsula and central Melville plateau persisted and probably remained cold-based until the final phases of glaciation; glacial erosion and depositional forms are largely absent. On the central Melville plateau, some frontal retreat occurred, as evidenced by declining levels of ice-dammed lakes on the western margin, but downwasting was the principal method of deglaciation. Hummocky terrain with large ice-block depressions suggests that there was a considerable amount of downwasting on the west margin of the ice cap on the central Melville plateau, and to a lesser extent, on the south part of the Hurd peninsula ice cap. Some of the thicker, hummocky till on the west side of the plateau cap could have been deposited late in the glaciation when the warm-based zones around the ice cap sheared over thinned stagnating ice that formed the kames on the edge of the Prince Albert Hills.

Subglacial and supraglacial meltwater were the most important agents modifying the landscape as the ice caps thinned, as evidenced by the abundance and types of meltwater features described in the section on glaciofluvial deposits. The sudden abundance of meltwater implies a rapid change from cold-ice to warm-ice conditions. The nested sets of lateral ice-marginal channels show the pattern of downwasting and backwasting of ice tongues in the tributaries of the Ajaqutalik River valley. If they are true lateral channels that developed along the margin of a cold ice cap, then their slope of 20 m/km is a reflection of the glacier profiles at the front of these late ice tongues, as they formed between the valley walls and the lateral edge of the ice tongues. If they are only associated with final melting, then they are probably sublateral features incised beneath the ice edge, and their slopes do not necessarily reflect ice profiles (Ives, 1959; Price, 1973, p. 113). Nevertheless, they still probably mark annual melt cycles. Less extensive flights of side-hill channels on the north side of the Hurd plateau attest to late ice tongues in that area as well. The vertical stacking of these channels suggests that downwasting exceeded backwasting during their formation.

The time of final deglaciation of the ice caps is unknown; however, these upland areas are snow-free for very brief periods at present; cap ice could have persisted until the late Holocene. Also, the presence of large ice wedges in hummocky till on the west part of the central Melville plateau

suggests that buried glacial ice may still exist in that area. These features are described below under 'Permafrost conditions and periglacial processes'.

Postglacial changes in sea level and sea-ice conditions

Dates from north of Jenness River indicate that sea level was at about 150 m above present at the time of deglaciation, about 6800 years ago (GSC-291). Relative sea levels had dropped to 140 m by about 6400 BP (GSC-4750), and to 100 m by 6200 BP (GSC-4812). In the Repulse Bay area, sea level fell from about 150 m at the time of deglaciation about 6800 years ago (GSC-286) to 105 m at 6500 BP (GSC-5110), and to 12 m by 3020 BP (GSC-7172).

As the land emerged, flights of bouldery beaches formed where the slope of the land was steep enough for storm waves to impinge on the shore. Offshore bars developed where slopes were gentler; these emerged to form sand and gravel berms with silty foreshore flats. The development of shoreline features in postglacial times depends on the amount of open water as well as the slope of the land; for instance, beaches are more prevalent today along the coast of Foxe Basin than along Committee Bay, which is choked with ice for most of the year. The relative abundance of beaches at high elevations suggests that there may have been a longer ice-free season in the mid-Holocene than at present.

Regional context

Until 1960, diagrams and regional maps showing the extent of glaciation were either blank in the area of Melville Peninsula, or showed ice flowing eastwards across the peninsula from an ice centre in the 'District of Keewatin' (Prest, 1957, 1990; Blackadar, 1958; Craig and Fyles, 1960). This ice configuration was maintained into the 1980s by some modellers (e.g. Mayewski *in* Denton and Hughes, 1981), although fieldwork by Sim (1960b, 1962; Fig. 39A) had shown that many ice-flow features in fact trended westward. In Sim's (1962) interpretation, westward-flowing ice from Foxe Basin crossed all of Melville Peninsula during the last glaciation, but local ice caps on the central Melville plateau developed during late stages of deglaciation. He believed that the westward-flowing ice encountered Keewatin Ice on the west side of the peninsula, forming an interlobate moraine (the Melville Moraine). Ives and Andrews (1963; Fig. 39B) explained all ice flow on Melville Peninsula and Baffin Island during the last glacial maximum as radiating from an ice centre in Foxe Basin. Craig (1965a) and later Dyke and Prest (1987; Fig. 39C) and Dyke and Dredge (1989) upheld these ideas. Dredge (1995a) indicated ice flows from Foxe Basin and later from Baffin Island across northern Melville Peninsula, but suggested that the main westward flow of ice from Foxe Basin was contemporaneous with nonerosive ice from a divide on central Melville Peninsula. Dredge (1995a) also reinterpreted the Melville Moraine as an ice-recessional feature related to deglacial calving bays, rather than as a full-glacial interlobate feature as Sim had done.

The data presented in this report lead to somewhat different conclusions about glaciation and ice flow on southern Melville Peninsula, and place more emphasis on the development and persistence of subsidiary ice divides on central Melville Peninsula, with flow across Rae Isthmus and the east coast governed by ice from the main dome in Foxe Basin (Fig. 39D).

Boothia Peninsula (Dyke, 1984) and the area west of Rae Isthmus were covered by ice flowing from Keewatin ice centres. The zone of convergence of ice from the Keewatin and Foxe sectors lies along Rae Isthmus and extends northward into Committee Bay. Granite cobbles on limestone bedrock on southwest Wales Island suggest that the limit of Keewatin Ice was about 87°W. Although Sim thought that Keewatin Ice reached the west coast of Melville Peninsula, evidence from this report suggests that Keewatin Ice did not cross Committee Bay.

ECONOMIC AND ENVIRONMENTAL GEOLOGY OF QUATERNARY MATERIALS

The geological maps 1847A–1851A and this report serve as fundamental documents for land-use planning and assessing environmental impacts. This section is a summary of aspects that are particularly applicable to land-use concerns: properties of surficial materials, granular resources, permafrost conditions, and present-day processes. Till geochemistry and mineral exploration aspects are treated separately under the section 'Till geochemistry'.

Physical properties of Quaternary materials

Grain-size data and lithic properties for the materials in this region are presented in previous sections of this report, and in the appendices. A brief summary of that data is presented here.

Regular till is composed of a silty sand matrix with a moderate amount of cobbles and boulder-sized material (Fig. 40). Regotill is slightly coarser, having a sandy or silty sand matrix, but a substantially higher boulder content. Blanket deposits of regular till tend to be moderately dense and have a high bearing strength when dry. Regotill deposits, especially ablation till, and till veneers tend to be loose and have a higher volume of voids. Sandy tills are generally better drained than silty tills, but where drainage is restricted due to proximity to impermeable bedrock or to frozen subsoils, the tills may become saturated and develop high porewater pressures, particularly during snowmelt. The tills are nonplastic, and can become fluid at moisture contents less than 30% dry weight. Mechanical vibration can change the state of the till from solid to liquid. The presence of mud boils on all till surfaces indicates that periglacial processes are active.

Fine-grained marine sediments, glaciomarine deposits, and till on Rae Isthmus range from being clayey silt to stony silty sand, and are slightly to moderately calcareous. Most of the glaciomarine deposits are slightly plastic. Typical liquid limits are about 15% and plastic limits are 9%. Soil moisture

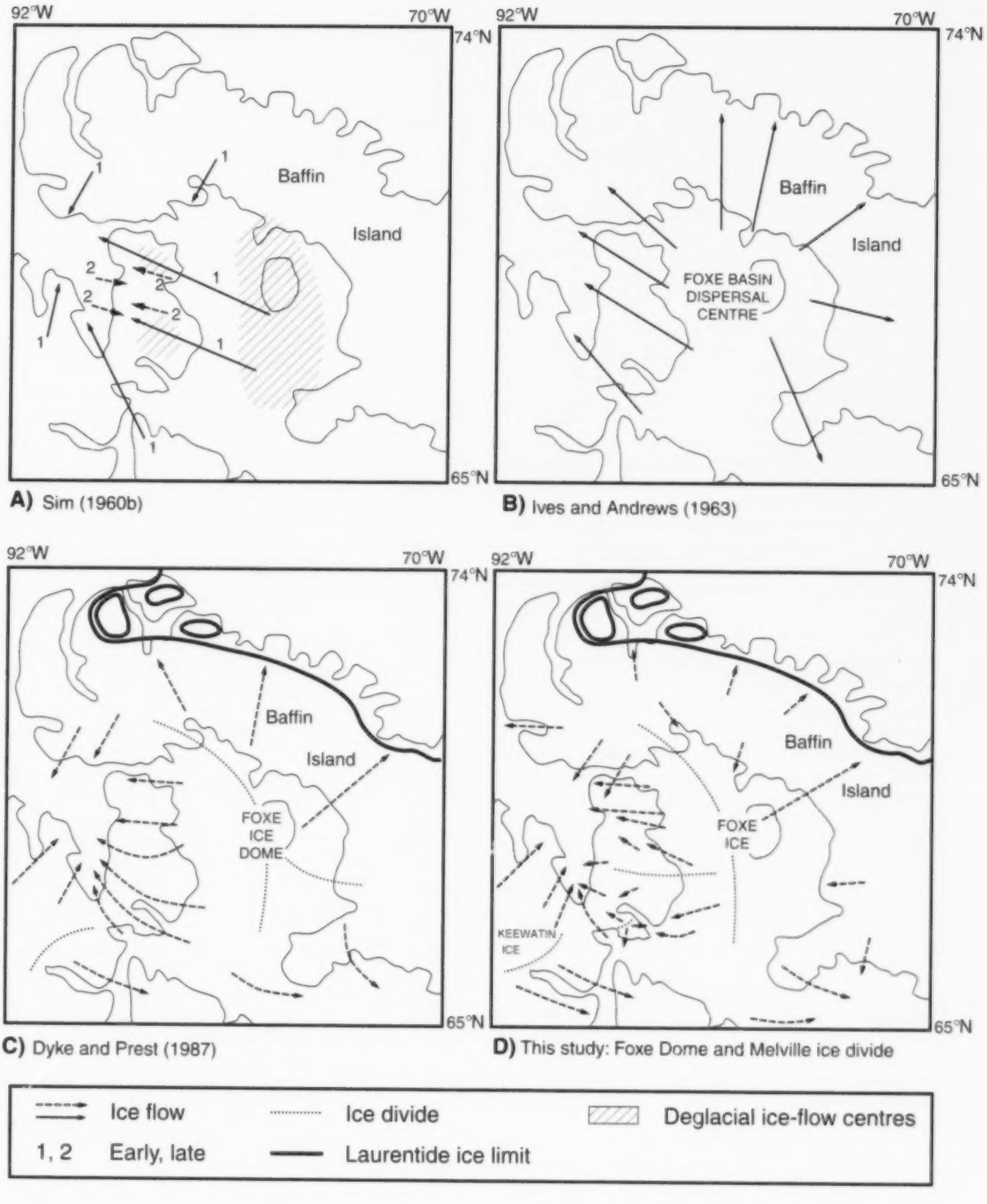


Figure 39. *Ice-sheet models for Melville Peninsula and Foxe Basin.*

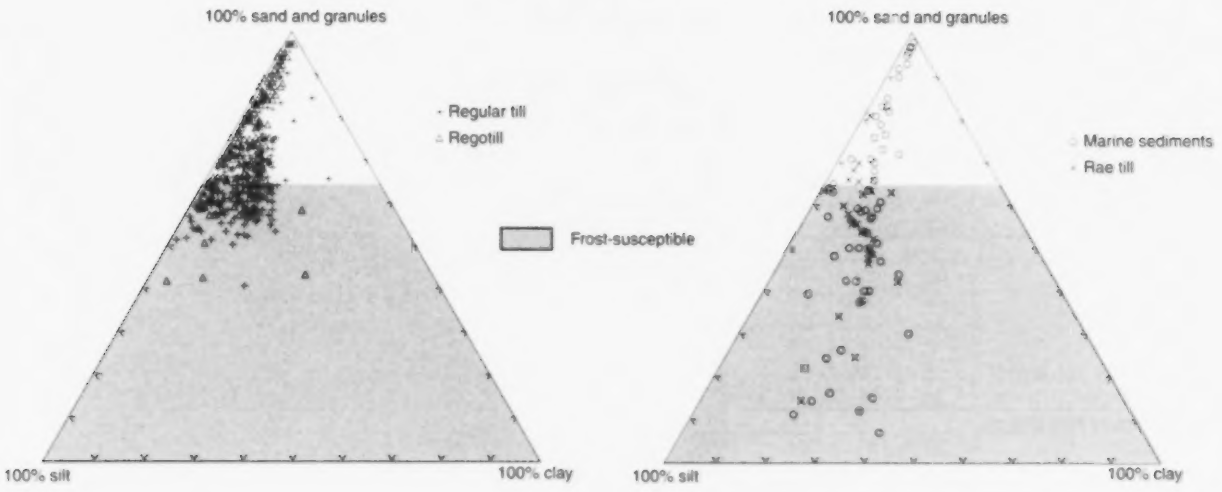


Figure 40. *Triangle diagrams showing textural characteristics and frost-susceptibility of surficial materials.*

content, which averages 10% on well drained sites in summer, is commonly slightly less than the liquid limit. Soil-water content is highest in early summer, immediately after snowmelt. The silty nature of the deposits makes them susceptible to the development of segregated ice lenses. Activities or climatic conditions leading to thawing of these lenses can lead to terrain disturbance.

Sand and gravel deposits useable for aggregate are relatively scarce on southern Melville Peninsula. The raised beaches along the coasts of the eastern half of the map area provide shallow sources of sand and gravel, or cobble aggregate. Beaches north of the Jenness River are composed of limestone, whereas others are composed mainly of granite and gneiss. Raised marine deposits on Wales Island are extensive, but are composed mainly of flat limestone fragments. Eskers and outwash deposits are the best sources of sand and gravel. Most eskers, however, are fairly small: outwash deltas at marine limit provide the most massive deposits of aggregate.

Permafrost conditions and periglacial processes

Present climate: air and surface temperatures

The area experiences a maritime polar climate (Table 3; Environment Canada, 1982). Average mean daily air temperature at the weather station at Mackar Inlet, 50 km north of the map area, is -15°C, and average temperatures remain below -20°C for six months of the year. Ground-surface temperatures become intensely cold in winter, especially in exposed areas where high winds (average 21 km/h) blow away the snow. Daily temperatures only fluctuate across the freezing mark in June on the central Melville plateau, and also in September near Repulse Bay. Because of the latitude, the diurnal variation in temperature is small, so that there are few freeze-thaw cycles above the ground surface per year, and only one — the annual cycle — between the ground surface and the base of the active layer.

Total precipitation is low, about 179 mm per year, of which 97 mm fall as snow. In lowland areas, snow remains on the ground until mid-June and begins to re-accumulate in late August or September. Steep, south-facing slopes have late-lying snowbanks, some semipermanent, that have been packed in by winds. During the years of fieldwork for this project, extensive late-lying snowfields have persisted on the central Melville plateau and Hurd plateau until late July, and have reformed by the beginning of August. It is possible that in some years, snow remains year-round.

Although the total amount of precipitation is low, the temperature is at or near dewpoint during the summer months, and fog is common on the east and west coasts in summer (Maxwell, 1981). Sea ice in Foxe Basin covers about 50% of the sea surface by the end of July and reforms at the end of September. Committee Bay is ice-free for a much shorter period of time, and commonly remains ice-filled, although shore leads develop during the summer.

Permafrost conditions

Southern Melville Peninsula lies within the zone of continuous permafrost, roughly 1200 km north of the continuous permafrost boundary. The closest lengthy thermal profile was obtained from Rowley Island well, in the northern part of Foxe Basin, and about 225 km north of the map area. The next nearest site lies about 400 km south of the map area, at Yathkyed Lake (Natural Resources Canada, 1995). At both sites the depth of permafrost is about 400 m, but mean ground temperatures at the base of the active layer are -1.9°C at Yathkyed Lake, and -8°C at Rowley Island. Both sites were deglaciated about 7000 years ago, but the southern site lies well above marine limit, while the Rowley Island well site

Table 3. Climate data for Mackar Inlet (Environment Canada, 1982).

Mackar Inlet, 69°N, 85°W, 430 m													
	J	F	M	A	M	J	J	A	S	O	N	D	Year
Precipitation (mm)													
Total	2	3	3	8	16	12	34	37	31	23	8	2	179
Rain	0	0	0	0	1	6	32	33	9	1	0	0	82
Snow	2	3	3	8	16	6	2	4	22	22	8	2	97
Temperature (°C)													
Mean daily	-31	-32	-29	-20	-10	-1	6	4	-4	-12	-22	-27	-15
Daily max	-28	-29	-25	-17	-7	2	9	7	-2	-10	-19	-24	-12
Daily min	-34	-35	-32	-23	-12	-3	3	2	-6	-15	-25	-30	-18
Range	6	6	7	6	5	5	6	5	4	5	6	6	6
Degree days above 0°C	0	0	0	0	1	40	185	146	15	0	0	0	387
No. days frost	31	28	31	30	31	26	9	12	27	31	30	31	317
Wind (km/h) Hall Beach													
Mean	22	23	21	21	21	19	17	19	24	25	23	21	21
Prevailing direction	NW	NW	NW	NW	NW	NW	N	N	NW	NW	NW	NW	NW

lies below the postglacial marine limit and probably only emerged about 3000 years ago. Ground temperatures depend partly on present climate conditions, and partly on glacial conditions or postglacial events. Areas of the central Melville and Hurd plateaus, which supported cold-based ice, may have had permafrost during and after the last glaciation, whereas permafrost on other parts of the peninsula which were under warm-based ice may have developed since deglaciation. Rae Isthmus and other areas that have recently emerged from the sea have thermal profiles that are in disequilibrium with present climate conditions. Areas above marine limit may also be in thermal disequilibrium because deglaciation did not occur until the late Holocene. In general, the character of the permafost on southern Melville Peninsula is probably similar to the Rowley Island well. Between the surface and 40 m depth, temperature varies between -2°C and -10°C. Profiles are isothermal at -8°C between 40 m and 90 m depth, and warm progressively to 0°C between 90 m and 400 m depth (Judge et al., 1981).

On southern Melville Peninsula, terrain thaws seasonally to a depth of 10–20 cm on the central Melville plateau, to 60 cm on dry terrain elsewhere, and to greater depths in low wetlands. Some massive ground ice remains in crevices throughout the year.

Ground ice, frost polygons, and giant fissures

Disseminated ice crystals are common in deposits at and below the frost table, and thin ice lenses were seen in fine-grained marine sediments. Massive ground ice, however, was observed in only a few places, although the prevalence of frost polygons on outwash terraces and sandy marine deposits suggests that ice wedges might be a common occurrence. The polygon troughs in these situations are generally less than 1 m wide on the surface. The abundance of thermokarst-created tundra ponds on Wales Island, and more limited thermokarst on fine-grained, raised marine sediment elsewhere suggest that bodies of segregated massive ice have formed. Massive ice was also observed at the base of opened joints in bedrock, where it remains throughout the year. Palsa were seen at only one location, on Rae Isthmus. Similarly, one pingo with a massive ice core was observed at the end of an outwash train in one of the valleys cut through the Prince Albert Hills (station 2405). This feature developed at the lower end of a gravelly aquifer and was probably generated by artesian pressures.

Polygons up to 60 m across with troughs up to 1.5 m wide are common in hummocky till on the central Melville plateau, Hurd plateau, and the Aua River area (Fig. 41). The fines have been removed from the troughs, leaving accumulations of boulders. The association of these large polygons with hummocky deposits and melt-out depressions on the central Melville plateau suggests that they developed in areas that had late glacier ice, a potential moisture source for the development of segregation ice.

Unusual areas of regularly spaced giant fissures or troughs cover parts of the central Melville plateau around and east of Souter Lake (plotted on Map 1848A), where ice-block depressions also occur (Fig. 42). These features are in parallel array and are oriented north-northeast regardless of slope aspect, running either across or parallel to contours. Fissures are spaced between 40 m and 100 m apart. Each fissure is about 300 m long. The fissures are 2–3 m wide at the surface, and are partly filled with an open-work boulder lag which probably resulted from the removal of fines from ablation till by meltwater. There is ice at the base of these cracks. Their invariant orientation, regular spacing, and association with ice disintegration features such as ice-block depressions suggest that they could reflect crevasse patterns or some other late-glacial aspect of the ice cap on the plateau. The persistence of relict glacial ice beneath ablation till is climatically possible, as temperatures on the plateau remains below 0°C for most of the year.

Figure 41.

Large ice-wedge polygons in bouldery regotill till northwest of Blake Bay, station 2108. Photograph by L.A. Dredge. GSC 1997-043M

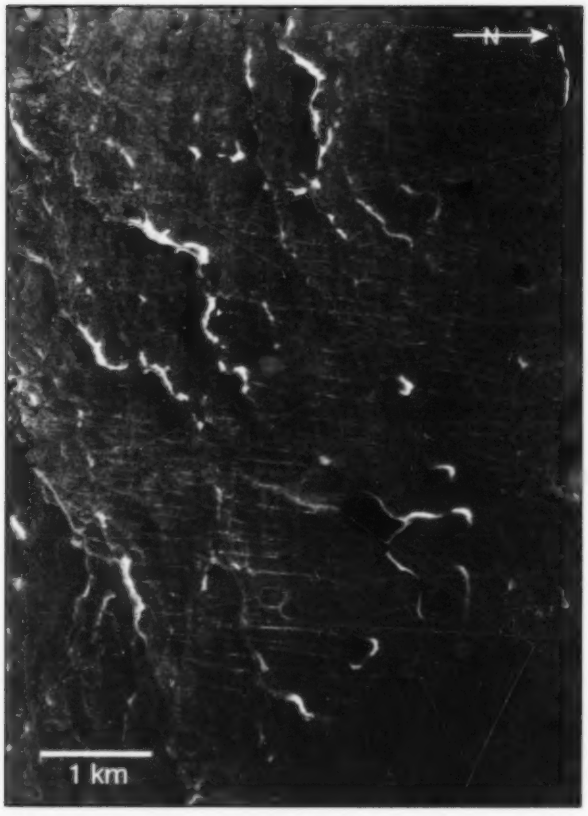


Figure 42. *Evenly spaced linear depressions trending north-northeast in ablation till associated with the ice cap on the central Melville plateau. Ice-block depressions and small disjunct meltwater channels suggest that downwasting occurred in this area. NAPL 15650-61, east of Souter Lake.*

Frost heave and shattered rock

Where there is only a thin layer of sediment over the bedrock, flat-lying limestone strata on Wales Island have been broken up and heaved into angular slabs. Frost heaving along near-surface (upper metre) bedding planes, with subsequent splitting into lenticular fragmants, has created extensive areas of shattered rock. Heaving processes in limestone involve both the migration of water to freezing sites, with volumetric expansion on freezing, and hydration weathering in capillary-sized fractures (Dredge, 1992). Some of the heaving may have occurred in shallow water, before the land emerged from the sea, although heaving is still an active process in the present subaerial environment.

Regotill areas are covered with extensive block fields generated in part from the heaving of granitoid rocks. Individual rock panels are 3–4 m across, and are shaped according to the joint pattern in the bedrock. Frost heave is an active process in the region, as demonstrated by the climate data, by postglacial rock bursts on meltwater-scoured surfaces, and the heaving of blocks up to 5 m wide out of glacially polished surfaces. Nevertheless, some of the block fields may be relict terrains, as some blocks appear to have been glacially moved and abraded after the frost shattering occurred.

Patterned ground forms

Mud boils, sorted circles, and stripes

During thawing and refreezing, materials in the active layer move in patterns that depend on sediment texture, moisture regime, and slope angle. The mechanics of formation of active-layer features are complex, but involve buoyancy-driven and gravity-driven cellular convection of wet material, with upwelling (diapirism) of the material in the centre, lateral movement at the surface, and sinking of particles at the edges (Mackay, 1980; Anderson, 1988). Patterned ground forms resulting from movement in the active layer include mud boils, sorted circles, and stripes.

Mud boils are prevalent on marine deposits, glaciomarine deposits, and till. The absence of vegetation on most of the mud boils suggests that processes are presently active enough to prevent the establishment of plants. Mud boils with silty sand centres surrounded by narrow rings of pebble gravel are prevalent on fine-grained marine and glaciomarine deposits. These features are commonly 50 cm to 1 m across. Most till surfaces are also covered with active boils that are similar in diameter, but tend to have broader rings composed of larger clasts. On the flanks of drumlins and valley slopes mud boils are elongated into nets and stripes.

Sorted circles and nets as large as 4 m diameter have developed on some parts of the central Melville plateau and Hurd plateau in areas of regotill, but these features do not occur on all surfaces there. They consist of small, sand-centred boils about 20 cm across, extensively ringed by pebbles and blocks made up of till boulders and shattered rock (Fig. 16). Depressions, possibly with ice wedges, form the perimeter of these features. Features that are presently active have unvegetated centres, whereas much less active forms are vegetated. The unusually large size of these features may relate to the coarser texture of material, to more intense lateral thrusting due to climatic differences on the high plateaus, or to high water contents and poor drainage in shallow till. If some of these features on the Melville plateau are relict forms that were preserved under central parts of the ice caps, their large size could also be related to the long time available for their development.

Solifluction lobes

Downslope movement of saturated sediments produces solifluction lobes. Small lobes are present on many slopes, particularly where late-lying snowbanks keep the soil moist. They generally consist of a partly drained, coarse cobble rampart with a saturated finer upslope tail. Many ramparts only stand about 1 m high. Intermediate-scale lobes are present where till has soliflucted onto the bare rock along the marine-limit trimline. Measurements on lobes along trimlines east of Lyon Inlet indicate that the till has crept 1–6 m in the last 6500 years (Fig. 36).

Lobes large enough to be seen on airphotos at 1:60 000 scale are shown on the maps accompanying this report. Such features are clustered on slopes in regotill. Individual lobes are up to 100 m wide, and the ramparts can be 4–5 m high. They develop where slopes are greatest, where the rock lies within 2 m of the surface, and where a high soil-water content is maintained by late-lying snow patches. Interstitial ice in the blocky ramparts may further assist in the mobilization of the largest blocks.

Chemical weathering

Chemical weathering of rock and glacial materials has been an active process throughout postglacial time. Weathering of marbles has been extensive; exposures of marble outcrop are recessed up to 15 cm more than interlayered gneissic rocks (Fig. 43). Marble rock surfaces are exceedingly rough where calcite crystals have been weathered out. All striae have been eroded, although deeper glacial grooves still remain. Marble boulders on till are often intensely weathered, and are surrounded by halos of marble gruss and feldspar laths that have weathered out (Fig. 20).

Differential weathering of minerals on the surfaces of granitic and gneissic rocks, most likely by lichen-weathering, is less extensive than weathering in marble terrane, but has produced pitted surfaces with up to 3 cm relief; however, a number of granitioid blocks on the central Melville plateau have decomposed to gruss.

Gossans in glacial troughs are commonly intensely hued, indicating that there has been chemical alteration in postglacial times. Mud boils in mineralized areas are commonly red-hued at the top, becoming yellow or grey-green at depth; reduction and oxidation are actively occurring in the present environment. The staining of striations on bedrock in these areas further indicates active oxidation of glaciated bedrock surfaces.

Chemical weathering is apparent in the limestone terrain on Wales Island. Piping was observed in scarp faces. Solution weathering has produced numerous small pits on the top surfaces of the platy limestone clasts that predominate on raised

Figure 43.

Differential postglacial weathering of interlayered marble and schist in an area of regular till. The schist outcrop (darker rock) has undergone some frost shattering and joint dilation in postglacial times, whereas the marble has weathered into gruss with corestones, station 3213. Photograph by L.A. Dredge. GSC 1997-043HH

beach ridges, and there are corresponding precipitates of secondary carbonate on the undersides of the clasts. Carbonate erratics on till surfaces have broken down into piles of fist-sized fragments.

Whereas most weathering is demonstrably of postglacial age, some of the weathering under the central part of the former ice cap on the central Melville plateau could be relict from earlier periods. For instance, there are more disintegrated granitoid blocks there than in other areas, differential weathering of minerals is greater, and mud boils in many places have a distinct reddish hue, whereas in normal till, typical boils are olive-grey, the characteristic colour of relatively unweathered minerals.

Coastal processes

Southern Melville Peninsula is surrounded by low-energy coasts. Slowly emerging land, low slope gradients, and shore-fast ice have limited wave erosion in the area. Both Foxe Basin and Committee Bay are frozen for most of the year. Most coasts at present are slowly prograding, and are delineated by foreshore flats and low, wave-generated beach ridges. Little longshore transport of material occurs. Most beach berms are small because of the limited areas of open water available to generate waves, and because of shoreline protection by shore-fast ice. During sea-ice break-up periods, ice-rafts are pushed onshore, creating small, irregular, ice-pushed ridges composed mainly of ice and reworked till or marine sediment.

TILL GEOCHEMISTRY

This section deals with trace-element concentrations in the clay fraction of the till, and supplements databases based on lake-sediment sampling (Geological Survey of Canada, 1978a, b). Till geochemistry is particularly important in this region due to extensive areas of drift cover and broken rock, both of which appear as undifferentiated material on recent bedrock maps. The till sampling program was designed to characterize bulk properties of till in the region. Although prospecting was not a prime objective of the project, and the sampling density is too low for detailed geochemical interpretations of the data, the results are useful for mineral exploration by providing estimates of regional background concentrations for various elements, for showing major patterns relating to source rock type and glacial dispersal, and for indicating some areas where more detailed work may be warranted. Furthermore, the results provide a basis for assessing concentrations of metals such as As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn, which are of environmental interest. Data and maps showing detailed percentile distributions of 38 elements in till have already been published as part of the surficial mapping project (Dredge, 1995b). The following section provides a statistical summary of data results, and shows distributions of selected elements.

The sections below describe the distribution of base metals and trace elements in the <0.002 mm fraction of the till. Minerals in the clay fraction, carbonate content of the silt-clay fraction, and the lithology of the pebble component of the till have been described in the 'Surficial materials and landforms' section of this report.

Methods

Five hundred and sixty till samples were collected over an area of about 40 000 km^2. The distribution of samples is shown on Figure 44. Site co-ordinates are listed in GSC Open File 3091 (Dredge, 1995b), and in Appendix A of this bulletin. Samples were collected from hand-dug pits in mud boils at a depth of about 0.5 m. The maximum depth of the active layer in this area is about 60 cm. Because of periodic overturning of till in the mud boils by frost action, the samples should be representative of the overall composition of the till throughout any given pit. Geochemical profiles through mud boils in southern Nunavut confirm that the composition of mud boils is homogeneous with depth (Klassen, 1995), and Schau (1983) has previously demonstrated that the composition of the clay fraction of the till in mud boils reflects the chemistry of the parent rock type.

The samples were centrifuged and decanted, and the <0.002 mm fractions were analyzed for aluminum*, silver, arsenic, barium*, beryllium*, bismuth, calcium*, cadmium, cobalt, chromium*, copper, iron, gallium*, mercury, potassium*, lanthanum*, lithium, magnesium*, manganese, molybdenum, sodium*, niobium, nickel, lead, antimony, scandium, tin, strontium*, tantalum, tellurium, titanium*, thallium*, uranium, vanadium, tungsten*, zinc, and zirconium. Elements were analyzed using inductively coupled plasma-atomic emission spectroscopy techniques after aqua regia (3HCl:1HNO_3) digestion (*=partial leach). Gold was analyzed using fire assay and instrumental neutron activation analysis of the <0.063 mm fraction.

Major factors controlling till geochemistry and the interpretation of geochemical data

Bedrock composition

Major rock types have been described in the 'Bedrock geology' section of the report. The principal three units of interest in the analytic results here are paragneiss and marble from the Penrhyn Group, mafic volcanic rocks and iron-bearing metasediments from the Prince Albert Group, and a variety of granitic and gneissic rocks. Field observations of mineralized boulders in till (Fig. 44) and the geochemistry results from the clay fraction of the till both suggest that there are more bodies of mafic volcanogenic rocks in the area than appear on bedrock maps, particularly on the Hurd peninsula, around Souter Lake, and within the Foxe fold belt, which is dominated by rocks of the Penrhyn Group.

Gossans determined from mapping of bedrock are shown in Figure 2. Many additional gossans were found during the surficial mapping project, and are shown on maps 1847A–1851A that accompany this report.

Clay-sized minerals

Shilts (1977) and Klassen (1995) have argued that most metals in till are scavenged by phyllosilicates in the clay fraction, and Shilts (1977) has reported that the phyllosilicates are produced by postglacial weathering; however, although clay minerals are present, particularly in regotill, X-ray diffraction results of the whole clay-size fraction of till, sampled during this project, show that the bulk of the material is rock flour (ground-up bedrock) consisting of feldspar, quartz, amphibole, and calcite and/or dolomite as well as mica and mixed-layer minerals. Quartz, though present, exists in less quantity in the clay fraction than in the silt fraction. Although clay minerals are known to be scavengers of metals, fine-grained, non-clay-mineral particles derived from glacial grinding can also scavenge metals, because these angular particles develop outer lattice deficiencies during glacial crushing and abrasion that produce negative charges on the particles, and consequently attract and adsorb cations just as clay minerals do. Thus, both weathered and unweathered particles are able to scavenge cations.

Glacial dispersal and erosion

Glacial dynamics and ice-flow history provide information on glacial dispersal of material from source rocks. Both regotill and regular till are derived from rocks that originate on southern Melville Peninsula. Regotill has not been moved far from bedrock sources, and in many cases, the amount of transport is less than 20 m. Material from regular till has been moved a greater distance from source areas, up to 40 km in some cases. Bouldery till from thin deposits probably travelled near the base of the ice sheet and has undergone less

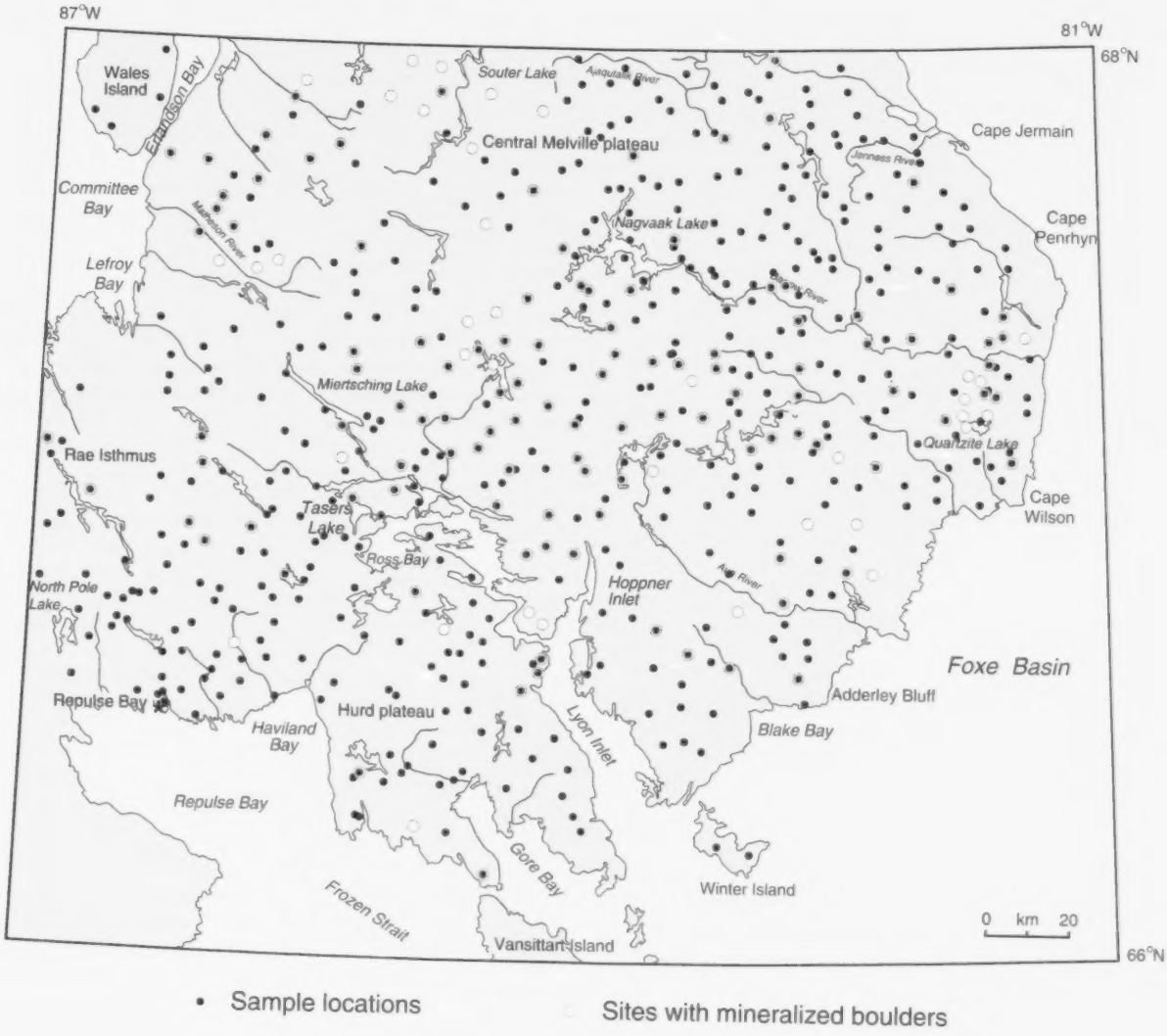


Figure 44. Till geochemistry: sample sites and location of mineralized boulders.

transport than sandy or silty till in thicker blanket deposits. The carbonate tills on Rae Isthmus and along the east coast have incorporated material that has been transported 20–100 km, and much of the material is derived from carbonate rocks not found on Melville Peninsula.

Ice dynamics also determine the amount of weathered material in the till. Areas under cold-based ice or beneath ice-flow centres were not glacially modified as intensely as other areas. Regotill in these regions, especially beneath the central Melville plateau and Hurd peninsula ice caps, has incorporated a considerable amount of material derived from old regolith. In contrast, both regular till and Rae Isthmus till were produced by more vigorous glacial erosion, and the resulting till composition is more representative of deeper, unweathered rock. In this sense, the regular till more closely reflects subsurface conditions than do surface rock exposures, which have undergone considerable geochemical weathering in some places (Cameron, 1979), particularly where sulphides are present. The presence of weathered material has two possible opposite end effects: 1) the weathered regolith contains more clay minerals than regular till, as shown by X-ray diffraction results, and so according to the arguments of Shilts (1977) and others, may contain more scavenged cations, or 2) as Cameron (1977) claims, glacially dispersed regolith has already been depleted in mobile elements.

Postglacial weathering and climate

Postglacial weathering is also a factor affecting element abundance. There is a range of opinion regarding the amount and effects of postglacial weathering on till geochemistry. Cameron (1979) has stated that most rock surfaces have undergone some degree of subaerial weathering in postglacial times, and in his opinion, most of the till and gossanous material on Melville Peninsula has been depleted of sulphides and other mobile compounds. Working farther south, Klassen (1995, p. 42) suggested, with more caution, that labile minerals such as sulphides are slightly oxidized in till. On southern Melville Peninsula, field observations and analytical data indicate that constant frost churning within the active layer prevents soil development, particularly in this arctic environment; normal till sampled from mud boils is only slightly weathered; however, that some weathering has occurred in postglacial times is indicated by Fe and Mn staining on some sulphide-bearing boulders in till, and by staining of striated rock surfaces. Lead/zinc ratios also show that some preferential weathering has occurred in gossans.

The minimal weathering proposed here differs from the conclusions of Cameron (1979, p. 187 and 191; *also* Cameron, 1977), who stated that "...recent oxidation has removed all but traces of these minerals (sphalerite, pentlandite, pyrrhotite, chalcopyrite and pyrite) from the surface". Weathering has been less extensive than Cameron implied from his lake-sediment studies, although his statements may still hold for sulphidic gossans, where substantial leaching of sulphides from gossan mud boils has been shown to occur (discussed below in 'Gossans'). Despite some leaching, most mud boils in gossan areas analyzed during this till sampling program show elevated metal concentrations. Cameron argued that till is not a suitable medium for drift prospecting (Cameron, 1979, p. 188), and that Zn and Ni are not retained in permafrost soils: the results from the surficial mapping and sampling show differently; i.e. that substantial quantities of mobile minerals such as Zn and Ni have remained in the till. Schau (1983), in accord with findings from this study, also found that mud boils do reflect the composition of parent rock types.

Redox potential

Redox potential also affects the preservation of elements in the till. Regotill and regular till composed primarily of alumino-silicate material produce slightly acid environments that promote leaching of sulphide and hydroxide minerals. Studies of water chemistry indicate that the pH in these areas of silicate rocks is neutral to slightly acid (Maurice, 1979). In contrast, till derived from the Proterozoic marble and Paleozoic carbonate rocks is slightly alkaline (pH 7–8) and tends to buffer leaching caused by sulphide oxidation. The presence of buffers, for instance, explains the relatively high Ni (83 vs. 66) and Zn (186 vs. 136) median values (Table 4) in the Penrhyn Group as opposed to other areas, but buffering does not explain the anomalously low concentrations of these elements in areas of limestone-derived till, which are also buffered. The difference in element abundance between the marble-derived till and limestone-derived till is one of primary source characteristics. The pH of waters near sulphidic zones in the Penrhyn Group is 5–6 (Maurice, 1979), and can be as low as 3–4 (Cameron, 1979; Agricola Lake). The presence of rapidly oxidized sulphide minerals such as pyrrhotite will contribute to the acidity of nearby materials.

Regional distribution of elements

Table 4 shows statistical summaries for all elements analyzed, based on data in GSC Open File 3091. Percentile values vary substantially from those on northern Melville Peninsula (Dredge, 1995a), due to the abundance of till consisting of material transported from Foxe Basin on northern Melville Peninsula. The accompanying proportional dot maps (Fig. 45) and frequency histograms (Fig. 46) show the geographic and statistical distributions of selected elements. Anomalously high concentrations are considered to be those exceeding the 99th percentile of the distribution, which is greater than two standard deviations above the arithmetic mean. The frequency distribution curves for most elements indicate that this cut off distinguishes disjunct concentrations from those at the high ends of the normal and log normal statistical distributions.

Calcium concentrations range from 0.01% to more than 10%, the upper detection level, with median values of less than 1%. The pattern for calcium generally follows that of carbonate in till and marine sediment, as presented earlier in

Table 4. Summary statistics of till geochemistry, southern Melville Peninsula.

Element	Unit	Detection limit	Minimum	Maximum	Mean	Standard deviation	Percentile							Number of samples
							10th	25th	50th	75th	90th	95th	99th	
Ag	ppm	0.2	0.1	20	0.6	1.3	0.1	0.1	0.2	0.6	1	2.5	4.7	539
Al	%	0.01	0.03	8.41	4.57	1.7	1.95	3.29	4.97	5.98	6.52	6.93	7.83	543
As	ppm	5	3	520	13	32.1	3	3	6	13	25	40	124	539
Au	ppb	1	0.5	105	3.5	8.8	0.5	0.5	0.5	0.3	8	13	43	244
Ba	ppm	10	5	1170	184	117.0	60	120	170	230	290	363	564	543
Be	ppm	0.5	0.3	13	0.48	0.6	0.3	0.3	0.3	0.3	0.5	1.25	3.45	260
Bi	ppm	5	3	42	2.3	3.1	3	3	2.5	2.5	2.5	4	15.3	543
Ca	%	0.01	0.01	>10	1.14	2.0	0.12	0.9	0.45	0.84	2.86	4.98	<10	539
Cd	ppm	0.5	0.3	7.5	0.3	0.4	0.3	0.3	0.3	0.3	0.5	0.5	1.5	539
Co	ppm	1	1	261	24	15.0	9	17	24	31	37	41	60	539
Cr	ppm	1	3	799	118	65.8	51	80	112	150	177	207	276	539
Cu	ppm	1	4	1626	108	100.2	35	60	92	127	187	236	444	539
Fe	%	0.01	1.75	>15	8.66	3.8	4.06	6.24	8.2	9.63	>15	>15	>15	539
Ga	ppm	10	5	23	1.8	4.4	5	5	5	12	15	16	20	543
Hg	ppm	1	1	7	1	0.5	1	1	1	1	1	1	4	539
K	%	0.01	0.02	4.64	1.43	0.7	0.57	0.9	1.42	1.86	2.39	2.72	3.58	543
Li	ppm	1	6	149	63	28.4	29	46	62	82	101	110	140	283
Lu	ppm	10	5	588	92.5	63.7	25	60	83	116	160	202	322	543
Mg	%	0.01	0.01	9.13	2.82	1.1	1.1	2.13	2.95	3.54	4.02	4.57	5.61	543
Mn	ppm	5	5	4135	636	330.9	297	485	600	793	913	1105	1706	539
Mo	ppm	1	1	166	7	19.1	1	1	2	4	16	40	117	539
Nb	ppm	5	3	9	3.1	1.4	3	3	3	3	6	6.35	8	283
Ni	ppm	1	1	570	78	52.6	24	43	74	100	127	166	258	539
Pb	ppm	2	1	238	32	19.6	13	20	30	41	52	64	94	539
Sb	ppm	5	3	15	2.2	1.3	3	3	3	3	3	4	8	543
Sc	ppm	1	2	35	18	6.5	8	13	20	23	25.5	27	30.8	260
Sn	ppm	20	10	2000	19	118.8	10	13	10	10	21	24	125	283
Sr	ppm	1	1	252	25	27.1	9	12	17	58	58	90	128	543
Ta	ppm	10	5	93	29	22.0	5	12	29	44	59	69	84	283
Te	ppm	10	5	19	7.5	3.6	5	5	5	11	13	14	17	283
Ti	%	0.01	0.05	1.44	0.22	0.1	0.05	0.11	0.21	0.32	0.39	0.43	0.53	543
Tl	ppm	10	5	80	11	12.5	5	5	5	10	30	40	69	260
U	ppm	10	5	130	56	7.7	5	5	5	5	5	5	9.5	539
V	ppm	1	0.5	1219	135.8	106.5	55	87	121	157	194	235	677	543
W	ppm	10	5	50	5	4.3	5	5	5	5	5	10	21	539
Y	ppm	1	3	69	19	7.3	12	15	18	23	28	30	40	283
Zn	ppm	2	1	1958	176	132.4	62	98	158	222	288	413	554	539
Zr	ppm	5	3	35	6.5	0.3	3	3	3	10	17	21	27	283

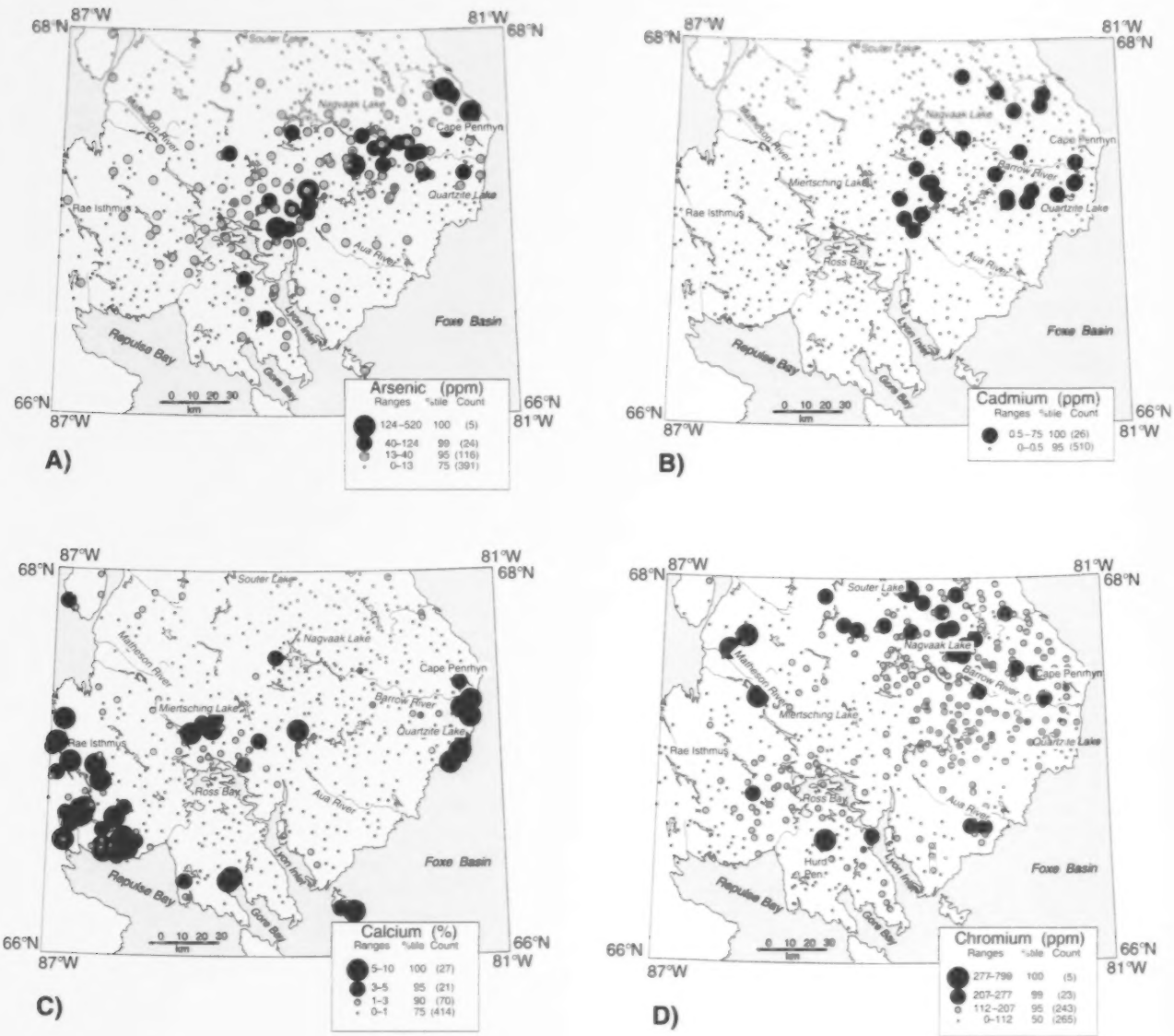


Figure 45. A)–Q) Geographic distributions of selected trace elements.

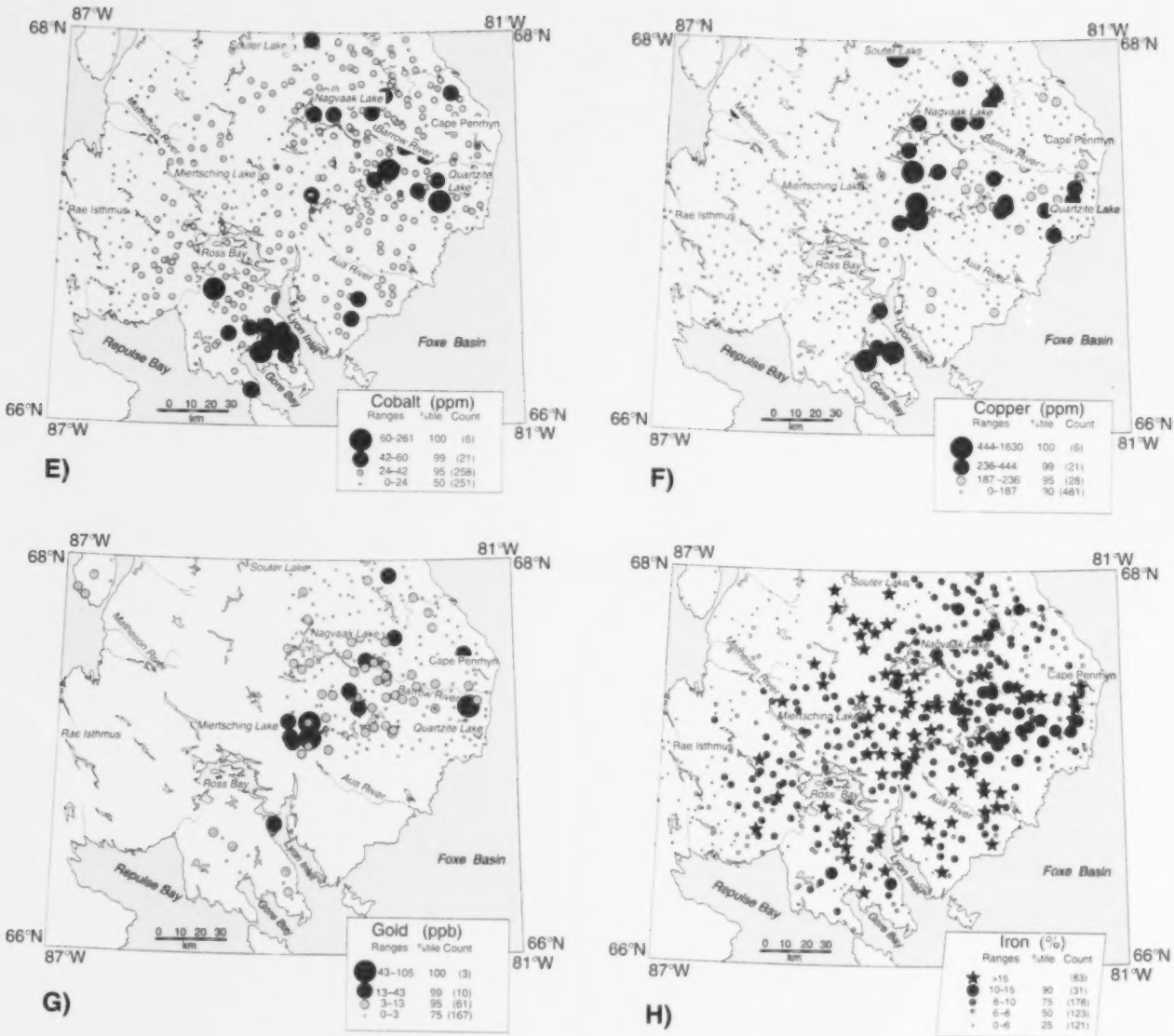
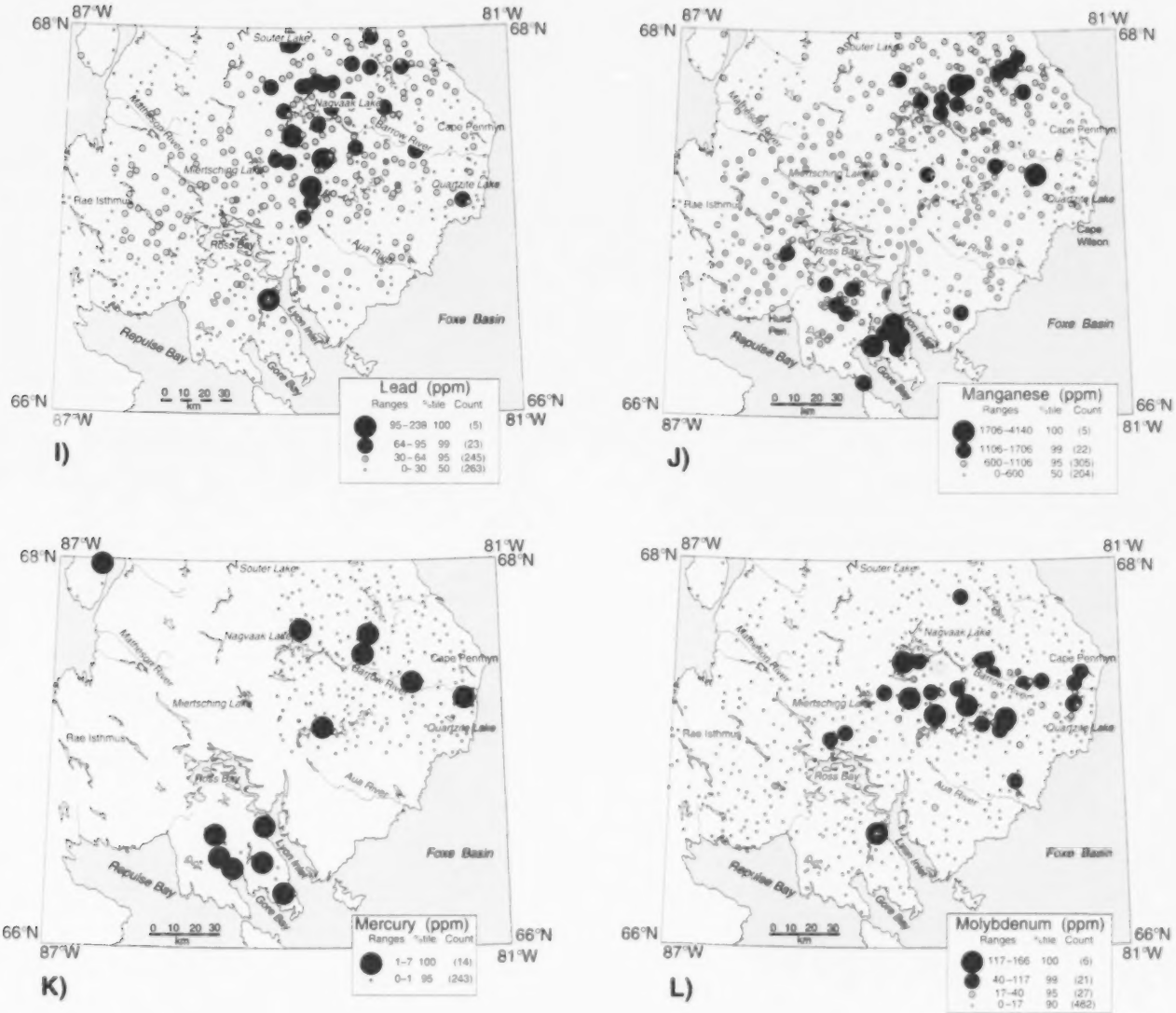


Figure 45. A)–Q) (cont.)



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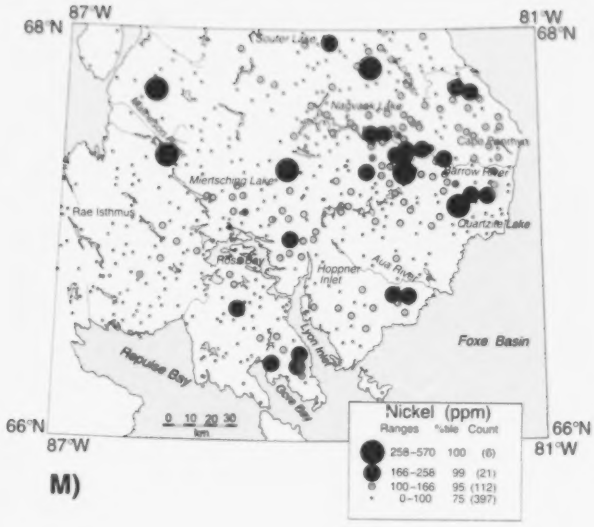

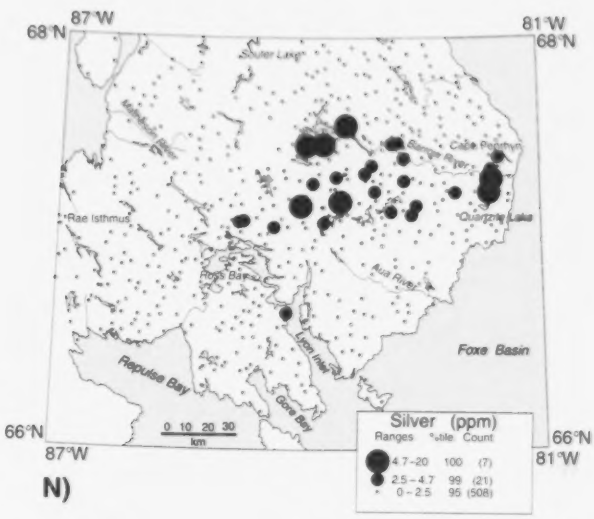

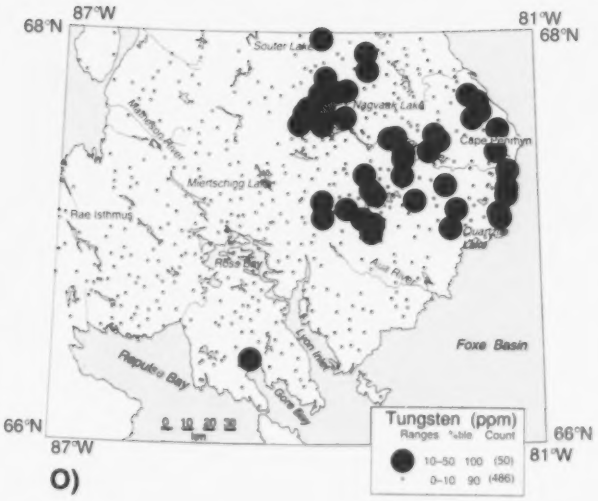

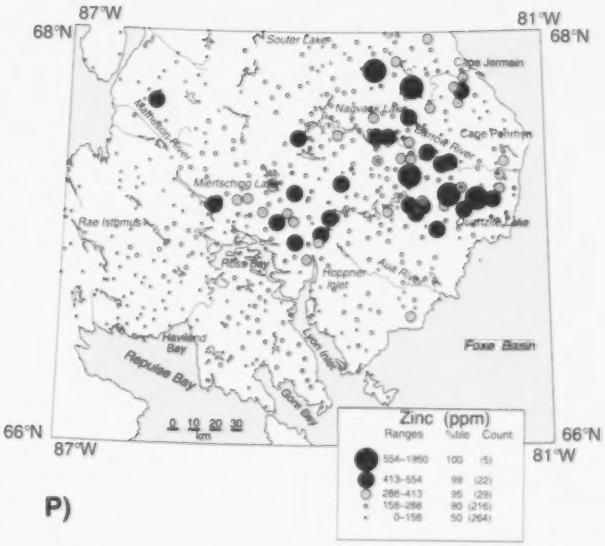

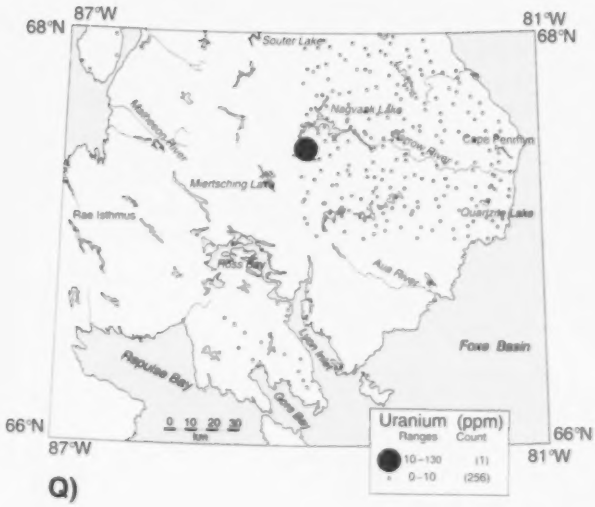

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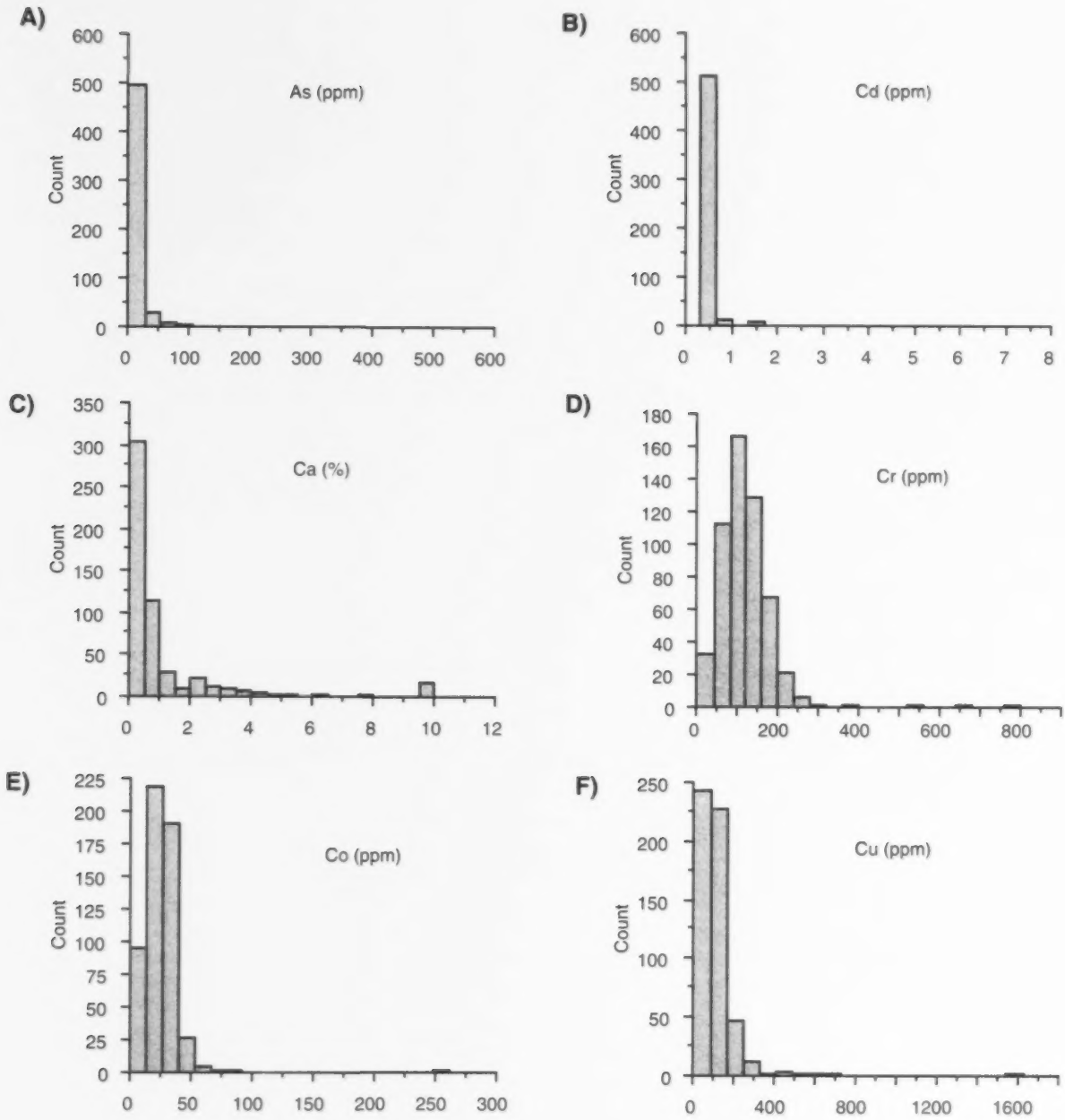

Figure 46. *A)–P) Frequency distributions for trace elements in till, <0.002 mm fraction.*

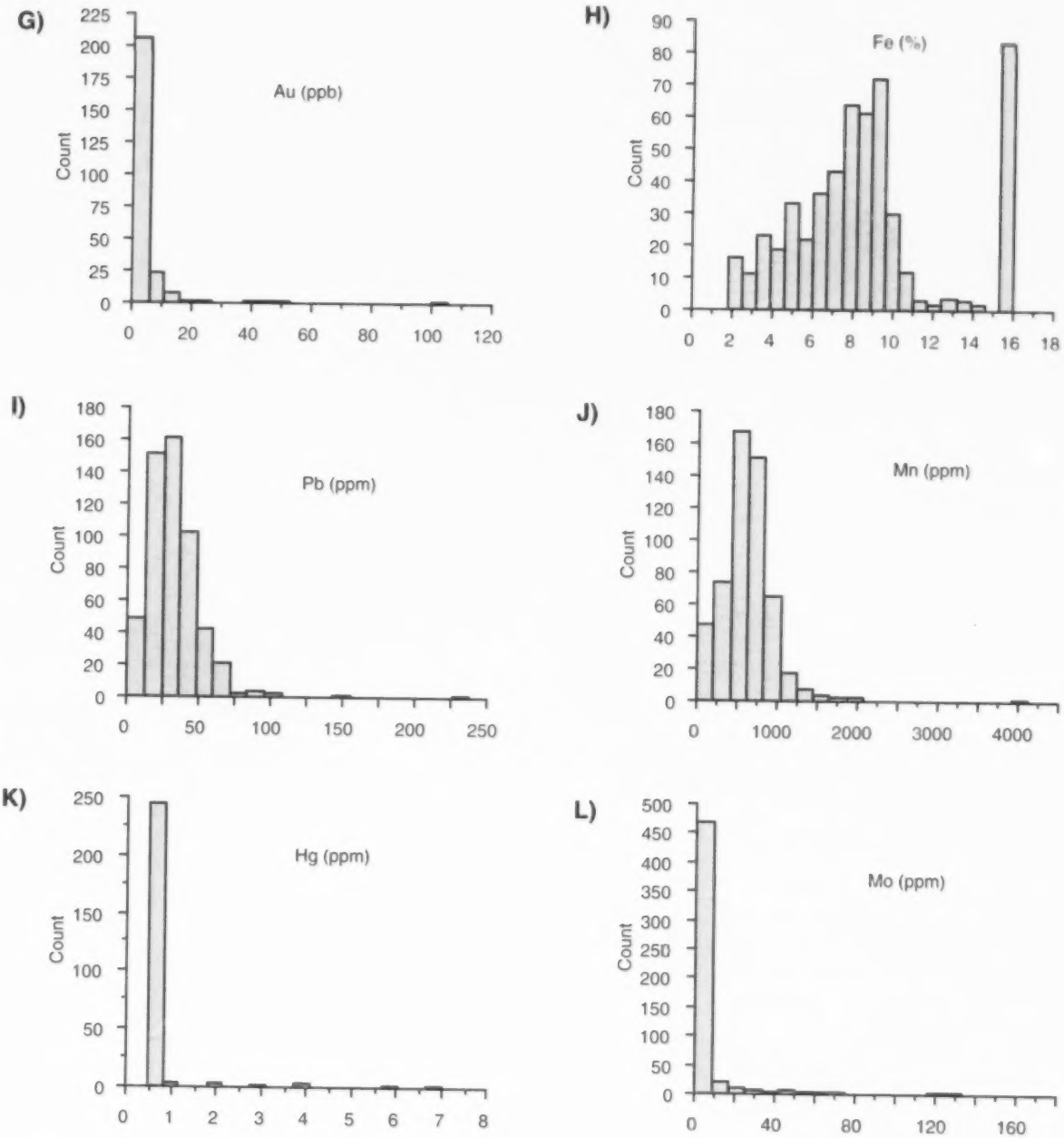

Figure 46. A)–P) (cont.)

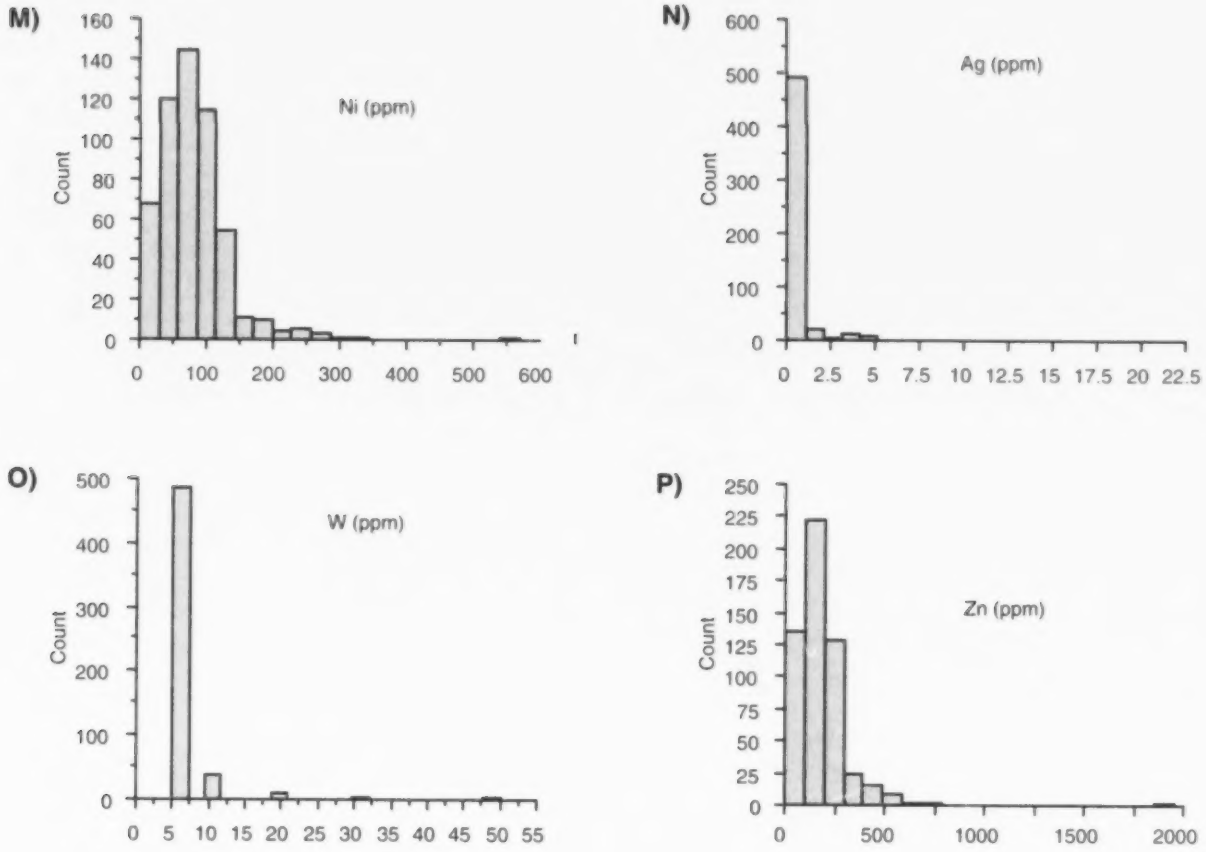

Figure 46. A)–P) (cont.)

the section on 'Surficial materials and landforms'. Concentrations exceeding 5% correspond to areas on Rae Isthmus and along the east coast, where Paleozoic carbonate from Foxe Basin was transported onto the peninsula. Other areas of granitoid rock and much of the Penrhyn Group rock areas have concentrations less than 1%, although some sites in areas of marble bedrock are up to 5%. Concentrations of 5% also occur near Miertsching Lake, where marble tills were vigorously transported by glaciers onto granitoid terrain. Sites with calcium south of Erlandson Bay near the west coast support the idea presented earlier that an ice sheet transporting Paleozoic carbonate crossed the peninsula during an early glaciation. Strontium concentrations (Dredge, 1995b) are similar to the pattern for calcium shown here.

Cobalt concentrations range from 1 ppm to 261 ppm, with a median of 24 ppm. Background concentrations are 10–42 ppm over most of the region, but are 0–10 ppm in the area of Rae Isthmus, due to the exotic till in that area. The highest concentrations are found east of Gore Bay (site 3415), although there are several other sites with elevated concentrations between 60 ppm and 80 ppm in gossans elsewhere. The concentrations at Gore Bay most likely relate to occurrences of mafic volcanic rocks, some of which do not appear on bedrock maps. There is a high statistical correlation between cobalt and manganese, and also with nickel, zinc, and copper.

Nickel concentrations range from less than 1 ppm to 570 ppm, with a median value of 74 ppm. Background concentrations range from 25–160 ppm across the peninsula, and tend to be higher within the Penrhyn Group than in other areas. Concentrations are slightly elevated along Barrow River, south of Aua River, and on the peninsula east of Gore Bay. Anomalous concentrations lie close to Matheson River near Prince Albert Group rocks, near Quartzite Lake, and at several other sites within the Penrhyn Group. The highest concentration is from till adjacent to a large, intensely hued gossan (site 3331), although the gossan material itself is depleted in nickel. High statistical correlations exist between nickel and cobalt, nickel and zinc, nickel and copper, nickel and chromium, and nickel and cadmium. On northern Melville Peninsula, the Ni-Co-Cr combination is strongly related to Prince Albert Group rocks.

Chromium ranges from 3 ppm to 799 ppm with a median value of 112 ppm. Background concentrations range from 3 ppm to 112 ppm in granitoid rocks on Rae Isthmus, and between 100–200 ppm in drift over the Penrhyn Group rocks. Elevated values more than 200 ppm are found at two sites on Hurd peninsula, but the highest concentrations lie farther north, in the Matheson River area and east of Souter Lake, at sites which contain material probably derived from nearby mafic volcanic rocks of the Prince Albert Group. The high concentrations are not related to visible gossans, although some iron oxide staining has been noted on boulders in those localities. Sites nearer Souter Lake having concentrations between the 95th and 99th frequency percentile do, however, relate to gossans. There is a statistical correlation between chromium and nickel.

Molybdenum ranges from less than 1 ppm to 166 ppm, with a medium value of 2 ppm. Background concentrations are from 1 ppm to 4 ppm, with values up to 40 ppm in some places. Sites along Barrow River have concentrations to 117 ppm. Anomalous concentrations are found in gossans within the Penrhyn Group and at a site on the north end of Lyon Inlet. Molybdenum is statistically correlated with iron, reinforcing the relationship with gossans.

Manganese concentrations vary from less than 5 ppm to 4135 ppm, with a median of 600 ppm. Concentrations from 300–1100 ppm are common throughout the region. Anomalous concentrations occur at scattered sites, with highest values near late granite bodies east of Gore Bay. Manganese highs do not relate to gossans. There is a high statistical correlation between manganese and cobalt, as well as geographic coincidence.

Copper concentrations range from 4 ppm to 1626 ppm with a median of 92 ppm. Values are typically very low in limestone-derived tills on Rae Isthmus, 30–125 ppm in granitoid-derived tills, up to 200 ppm in tills associated with Penrhyn Group rocks, and to 450 ppm near the Prince Albert Group. Anomalies occur in gossans in Penrhyn and Prince Albert group rocks, but highest values are in an area east of Gore Bay, where there are probably unmapped mafic rocks. High copper concentrations are associated with gossans. Copper is statistically correlated with cobalt, nickel, and zinc.

Zinc concentrations range from less than 2 ppm to 1958 ppm, with a median of 158 ppm. Regional median concentrations are slightly higher than crustal norms (Rose et al., 1979). Background concentrations are noticeably different between granitoid sources, where they are 50–200 ppm, and the Penrhyn Group rocks, where concentrations are commonly 150–400 ppm. Anomalous concentrations greater than 550 ppm are associated with marble zones, or schist-paragneiss-marble contacts in the Penrhyn Group. The highest zinc concentration is located near a gossan (site 3331), but the gossan itself shows zinc depletion. Zinc values are statistically correlated with lead, copper, nickel, and cobalt.

Lead concentrations range from less than 2 ppm to 238 ppm with a median of 30 ppm. Background concentrations are 10–30 ppm in granite and gneiss areas, and 10–65 ppm in the eastern part of the Penrhyn Group, with concentrations to 95 ppm north of Nagvaak Lake. Anomalous concentrations are associated with gossans in a variety of rock types, and gossans are enriched in lead relative to till sampled beyond the oxidized material.

At most sites, concentrations of cadmium, mercury, and uranium are below detection limits. Cadmium concentrations are generally below the lower detection limit of 0.5 ppm; however, there are a number of sites in the Penrhyn Group where concentrations are up to 7.5 ppm, well above norms for crustal rocks. These higher values are associated with zinc at some localities. Concentrations greater than 1 ppm are of interest for environmental baseline studies.

The ICP-AES method is not a good means of testing for mercury levels (Rose et al., 1979, p. 55). The presence of sites with concentrations that may be elevated, however, suggests that some areas have mercury levels in the soil environment that are well above 1 ppm, and above normal crustal concentrations. The highest values are on Wales Island and near a dyke along Barrow River.

Similarly, most uranium concentrations in till are below the detection level of 10 ppm. An exception is site 3064, a gossan, where a value of 130 ppm was reported. This site lies in an area of Penrhyn Group rocks near, but not at, a late granite intrusion. Concentrations above 10 ppm are rare in water and lake sediments over most parts of the shield, but concentrations commonly exceeding 20 ppm occur on southern Melville Peninsula (Maurice, 1979). Lake samples, together with supporting radiometric data indicate that late-forming granite plutons on southern Melville Peninsula are the uranium sources. Maurice attributed the high concentrations on southern Melville Peninsula to alkaline environments associated with marble in the Penrhyn Group. Site 3064 lies within Maurice's (1979) area where uranium concentrations from lake-sediment samples exceed 50 ppm. Given Maurice's (1979) data, it is surprising that uranium was not above detection level at other sites within the Penrhyn Group, and in other areas where there are late granite intrusions, despite problems with uranium detection using the AES method.

Only part of the area has been analyzed for gold, and there are no analyses for areas where mafic volcanic rocks are known. Concentrations are generally low, ranging from less than 1 ppb to 105 ppb, with a median value that is less than the detection limit. Concentration of less than 13 ppb are common. The highest concentrations are associated with gossans at site 3347 north of Quartzite Lake (Fig. 47), and sites 3093–3097 north of the headwaters of the Aua River. Elevated concentrations are also located in a gossan at the north end of Lyon Inlet.

Silver concentrations range from less than 0.2 ppm to 20 ppm, with a median of 0.2 ppm. Silver content is below detection limits at most sites, but numerous areas of the central Pehrhyn Group have concentrations up to 4.7 ppm. All anomalies are found within gossans in the Penrhyn Group, with the highest concentration being north of Quartzite Lake (site 3347), where elevated gold levels were also obtained. As with gold, relatively high concentrations are located north of the Aua River headwaters.

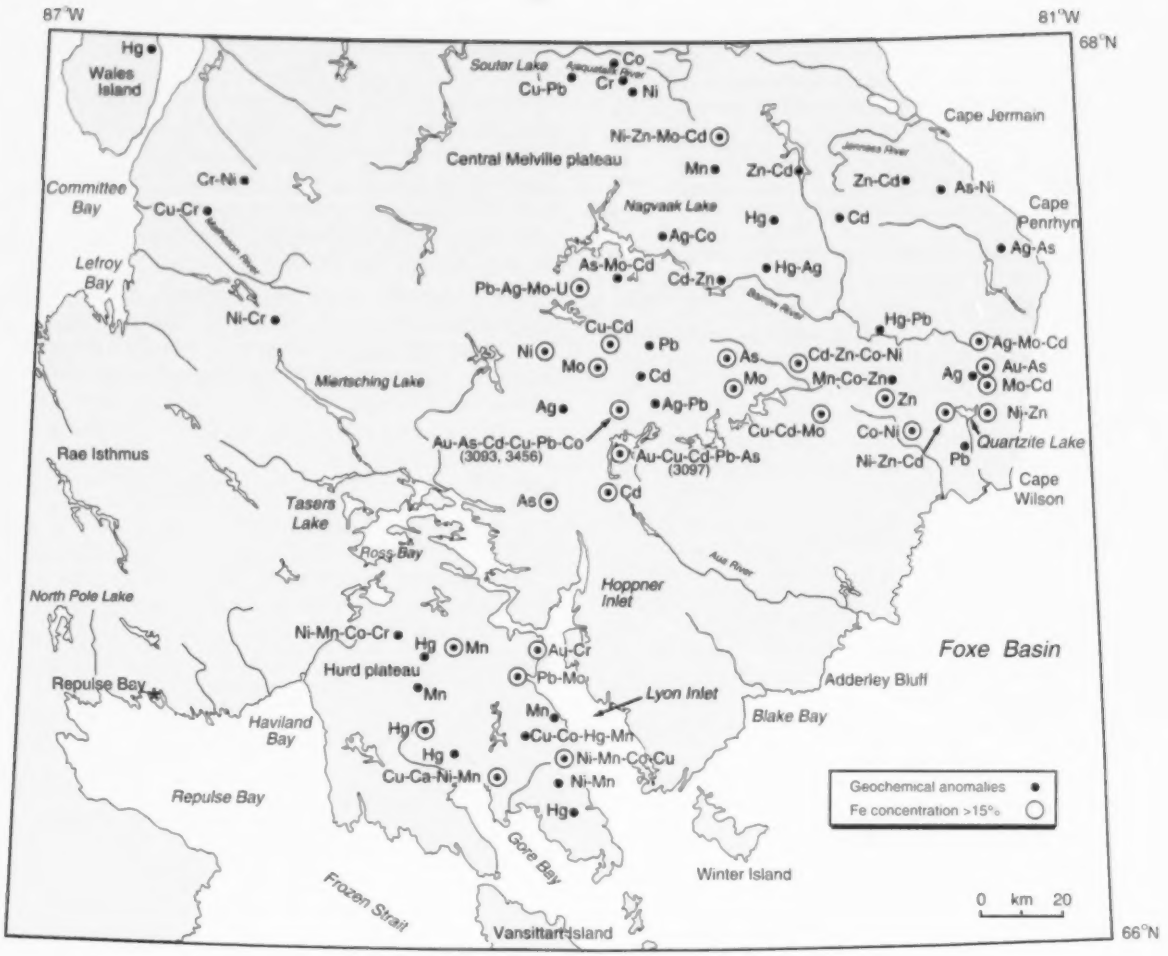

Figure 47. *Geochemical anomalies. Numbers in parentheses are sample sites.*

Arsenic concentrations range from less than 5 ppm to 520 ppm, with a median of 6 ppm. Concentrations of 6–40 ppm are common, but somewhat elevated concentrations, to 124 ppm, occur in areas underlain by schist and paragneiss in the central belt of the Penrhyn Group. The highest values are associated with the gossan at site 3093, as is gold, but other sites with anomalously high concentrations are not related to gossans.

Iron concentrations range from 1.75% to more than 15%, the upper detection limit, with a median of 8%. Concentrations as high as 38% have been reported from banded iron-formation in the Prince Albert Group (Wilson and Underhill, 1971). Iron concentrations are low in the Rae Isthmus area, and generally are low over granite bedrock (<6%), but concentrations up to 10% are common in gneissic rocks, and generally are elevated to between 10% and 15% in till overlying Penrhyn Group rocks. Concentrations more than 15% effectively map out the sampled gossans in the area.

Gossans

Maps 1847A–1851A show all visible gossans, including those noted by Heywood (1967), Frisch (1982), and Henderson (1983). Gossans are more prevalent in some rock types than in others. Most of the observed gossans on southern Melville Peninsula lie within the Penrhyn Group, along valley walls forming the contact between schist and/or paragneiss and marble, as reported by Henderson (1983). Numerous gossans in this geological situation lie in the northeast part of the map area. One major belt lies north and northeast of Ross Bay. Another belt ranges between Cape Wilson (south of Quartzite Lake) and Cape Penrhyn near the east coast. Gossans are also associated with the volcanogenic rocks in the Prince Albert Group west of Souter Lake, as indicated by concentrations of mineralized boulders seen in the till, and also with mafic volcanic rocks of unknown origin on Hurd plateau. In some places, the gossans probably delimit

unmapped slices of Prince Albert Group rocks. Pyrite, chalcopyrite, pyrrhotite, and molybdenite are associated with gossans in the volcanic rocks of the Prince Albert Group, and magnetite and pyrrhotite associations are found in sedimentary banded iron-formation (Frisch, 1982; Schau and Digel, 1989; Schau, 1993). Sphalerite, pyrite, pyrrhotite, pentlandite, and chalcopyrite are associated with mineralization at gossans in the Penrhyn Group (Cameron, 1979; Henderson, 1983).

Some of the largest gossans lie 10–30 km northeast of Ross Bay. These cover areas of up to several hectares, are intensely hued, and are concentrically coloured from red at the centre, through rusty orange zones, to olive-green at the edges. Other gossans in that area consist primarily of quartz gruss coated with yellow limonite. These properties indicate that there has been intense weathering and differential leaching of the large gossans. Sampling of the gossans north of Ross Bay by Cameron (1979) led him to conclude that sulphide oxidation had removed almost all the base metals from gossanous mud boils on southern Melville Peninsula, except where marble buffered the soil. The Ross Bay gossans, however, are also in marble zones, so his argument is not entirely valid. Certainly, the results of the till sampling program presented here indicate that the Ross Bay gossans do not contain high concentrations of metals, but Ni, Zn, and other metals are associated with gossans in other areas of Penrhyn Group rocks. The enormous size of the Ross Bay gossans suggests that they may be cores of features that developed during a prolonged period of preglacial weathering, and that they were not totally eroded away during the last glaciation. Another possibility is that they initially contained much higher quantities of Ni and Zn sulphides, which, when oxidized, acidified the area to the extent that most other metals were also mobilized.

Smaller gossans, slightly rusty-orange, more likely developed in the postglacial period, and these indicate the proximity of high concentrations of metallic elements, including mobile metals such as Zn, Cd, and Ni. Mineralized boulders in the till near small gossans contain visible iron sulphides, mainly pyrite, arsenopyrite, and chalcopyrite. Despite the high levels of metals relative to areas more remote from gossans, there has still been some leaching of sulphides and labile minerals in gossans in the postglacial period, although not to the extent indicated by Cameron (1979). Comparison of 18 pairs of samples from gossans and adjacent nonoxidized till indicates that Ag, Au, Pb, Cu, Mo, and Fe are enriched in gossans, whereas As, Zn, Co, Ni, and Cr are depleted; other metals are in the same concentrations in both gossans and adjacent unoxidized material. Concentrations of Zn and Ni in gossans are much less than regional median values, whereas Co and Cr are somewhat less. Arsenic concentrations in gossans remain slightly higher than in unmineralized zones. The relative depletion of Ni and Zn suggests sulphide mobilization. Lead/zinc ratios are higher in the gossans than in adjacent nongossanous tills, also indicating leaching of labile constituents. Lead/zinc ratios are also higher in gossans in areas of regotill than in areas of regular till, suggesting that time and weathering may be important factors in leaching.

Anomalies

The location of anomalously high concentrations of elements is shown of Figure 47. Anomalies are defined as concentrations in excess of the 99th percentile of the frequency distribution. Although some of the anomalies may simply represent the high end of the background values of individual elements, as indicated on the histograms, others may designate elevated concentrations of interest to mineral exploration. Many anomalies are associated with gossans and with till directly adjacent to gossans; those anomalies are circled.

No anomalous concentrations of elements are located on Rae Isthmus, which is covered by till and marine sediments derived from Paleozoic carbonate. Chromium-nickel-copper groups are associated with Prince Albert Group rocks in the western part of the peninsula. Similar combinations, in places with Mn and Hg, may relate to unmapped septa of Prince Albert Group sediments or other mafic volcanogenic rocks, especially in the area between Gore Bay and Lyon Inlet.

Zinc-cadmium associations are common in the area of Penrhyn Group rocks, as are anomalies of Pb, As, and Ag. Zinc-cadmium associations are not associated with gossans in the northern part of the Penrhyn Group, but are found in gossans, along with Ni-Co, in the southern part. Additional multiple-element combinations, including Ag-Mo-Ni-As-Cd are present in the string of small gossans near the east coast between Quartzite Lake and Cape Penrhyn. Although the Ross Bay gossans do not have anomalous concentrations of metals, gossans farther to the northeast (between sites 3097, 3093, and 3046), indicated on Figure 47 have high concentrations of Au-As-Cd-Cu-Pb-Co. Mineralized boulders were abundant in the till in that area as well.

Maximum concentrations of Co, Ni, Cr, Mn, and Pb are higher on northern Melville Peninsula than on southern Melville Peninsula, because more material derived from the Prince Albert Group was sampled there. Maximum concentrations of Mo, As, Zn, and Cd, on the other hand, are higher on southern Melville Peninsula, and are related to sulphide mineralization in the Penrhyn Group. The abundance of anomalies led Cameron (1979) to propose that there had been a major influx of base metals into the Proterozoic basin now represented by Penrhyn Group metasediments.

Median values for almost all elements are greater on southern Melville Peninsula than on northern Melville Peninsula, and these values more closely reflect the overall composition of rocks on Melville Peninsula than do median values derived from samples on northern Melville Peninsula, because of the influx of large quantities of till from Paleozoic carbonate sources in Foxe Basin onto the northern part of the peninsula.

Applicability of till sampling

Cameron (1979) made a number of statements regarding surface weathering of rocks and depletion of elements in gossans. He concluded that mud boil (till) sampling was not a reliable means of assessing elements in rock, due to mobilization of labile minerals. His conclusions from Melville

Peninsula are based on anomalously depleted gossans. The data presented here indicates that his statements, while true for intensely altered gossans, do not hold for till sampling in general, for several reasons. 1) Because of removal of weathered surfaces during glaciation, much of the till consists of fresh material. 2) Mud boils are relatively unoxidized, due to frost churning in this arctic environment. Mud boil material is more representative of unweathered bedrock than postglacially weathered rock surfaces. 3) Most gossans are not as depleted in labile minerals as the large ones that Cameron (1979) sampled, which are anomalously low in mobile elements related to sulphides. Also, even in the depleted gossans, adjacent till still shows anomalously high concentrations of metals. Indeed, till sampling can be very effective if gossan-nongossan sample pairs are taken, along with regional samples for assessing background element concentrations.

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APPENDIX A

Sites and sample locations.

Sample	Station	Unit	Zone	Easting	Northing
No sample	1009	Outwash	17	445600	7537690
88-DU-1016	1010	Till	17	445000	7538900
88-DU-1015	1011	Till	17	451100	7526650
88-DU-1033	1012	Till	16	381100	7524800
88-DU-1121	1115	Till	16	560000	7541600
No sample	1696	Marine	17	452050	7514890
No sample	1697	Regotill	17	446030	7510220
No sample	1698	Regotill	17	444510	7515140
No sample	1699	Till veneer	17	450200	7518570
No sample	1800	Till	17	453700	7519550
No sample	1801	Marine	17	458810	7525700
No sample	1802	Till veneer	17	455490	7528350
88-DU-1432	1803	Till	17	455090	7529240
No sample	1804	Till veneer	17	451500	7531290
No sample	1805	Marine	17	449530	7532810
No sample	1806	Marine	17	451140	7537490
88-DU-1262	1807	Marine	17	443840	7534080
88-DU-1430	1808	Marine	17	444980	7534310
No sample	1809	Till	17	448260	7526280
88-DU-1433	1810	Marine	17	451000	7527000
No sample	1811	Marine	17	459200	7523000
90-DU-2001	2001	Rae till	16	531800	7413500
90-DU-2002	2002	Marine	16	515600	7451200
90-DU-2003	2003	Till	16	541600	7485500
90-DU-2004	2004	Marine	16	530200	7499900
90-DU-2005	2005	Marine	16	526000	7508500
90-DU-2006	2006	Till	16	564200	7499200
90-DU-2007	2007	Till veneer	16	564000	7445500
90-DU-2008	2008	Till	16	550200	7394000
90-DU-2009	2009	Rae till	16	551800	7386300
90-DU-2010	2010	Till veneer	17	395100	7471000
90-DU-2011	2011	Till	17	431200	7494900
90-DU-2012	2012	Till veneer	17	370900	7431400
90-DU-2013	2013	Till	17	376100	7414100
90-DU-2014	2014	Marine	17	377000	7414400
90-DU-2015	2015	Marine	17	372300	7410100
90-DU-2016	2016	Marine	17	373200	7426600
90-DU-2017	2017	Marine	16	567100	7399300
90-DU-2018	2018	Marine	16	522800	7399400
90-DU-2019	2019	Rae till	16	520200	7400300
90-DU-2020	2020	Rae till	16	521400	7404600
90-DU-2021	2021	Marine	16	518500	7407300
90-DU-2022	2022	Rae till	16	515800	7407400
90-DU-2023	2023	Rae till	16	517500	7404900
90-DU-2024	2024	Marine	16	515400	7400900
90-DU-2025	2025	Rae till	16	510500	7401200
90-DU-2026	2026	Rae till	16	507600	7405000
90-DU-2027	2027	Rae till	16	507700	7409300
90-DU-2028	2028	Rae till	16	519000	7397600
90-DU-2029	2029	Rae till	16	513500	7394700
90-DU-2030	2030	Marine	16	508600	7395200
90-DU-2031	2031	Marine	16	515600	7390800
90-DU-2032	2032	Rae till	16	509800	7385500
90-DU-2033	2033	Marine	16	497500	7392000
90-DU-2034	2034	Rae till	16	494000	7388600
90-DU-2035	2035	Rae till	16	496900	7386500
90-DU-2036	2036	Rae till	16	491200	7380100
90-DU-2037	2037	Marine	16	517000	7380500
90-DU-2038	2038	Marine	16	519500	7381000
90-DU-2039	2039	Marine	16	526400	7382300
90-DU-2040	2040	Rae till	16	509900	7383300
90-DU-2041	2041	Till	16	555900	7435700
90-DU-2042	2042	Till	16	559800	7438400
90-DU-2043	2043	Till veneer	16	558900	7448300
90-DU-2044	2044	Till veneer	16	552600	7456000

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2045	2045	Till	16	558200	7462400
90-DU-2046	2046	Till	16	561200	7468900
90-DU-2047	2047	Till	16	566800	7469400
90-DU-2048	2048	Regotill	16	562600	7477300
90-DU-2049	2049	Regotill	16	561600	7479800
90-DU-2050	2050	Regotill	16	555900	7474200
90-DU-2051	2051	Regotill	16	544500	7472300
90-DU-2052	2052	Till	16	541600	7459300
90-DU-2053	2053	Till	16	544000	7437400
90-DU-2054	2054	Till	16	567500	7435200
90-DU-2055	2055	Till	16	568400	7454000
90-DU-2056	2056	Rae till	16	528900	7406800
90-DU-2057	2057	Rae till	16	523600	7406400
90-DU-2058	2058	Rae till	16	525400	7406200
90-DU-2059	2059	Till	16	532700	7410000
90-DU-2060	2060	Till	16	525200	7419500
90-DU-2061	2061	Till	16	529900	7420700
90-DU-2062	2062	Rae till	16	520700	7427000
90-DU-2063	2063	Till veneer	16	526500	7429600
90-DU-2064	2064	Till veneer	16	535800	7424400
90-DU-2065	2065	Till	16	541300	7423400
90-DU-2066	2066	Till	16	540600	7420300
90-DU-2067	2067	Till veneer	16	535800	7418800
90-DU-2068	2068	Till veneer	16	540400	7409500
90-DU-2069	2069	Rae till	16	524400	7403100
90-DU-2070	2070	Rae till	16	534900	7397600
90-DU-2071	2071	Marine	17	369400	7412900
90-DU-2072	2072	Till	17	370200	7417800
90-DU-2073	2073	Till	17	369700	7422800
90-DU-2074	2074	Till	17	377700	7423500
90-DU-2075	2075	Till	17	376500	7432000
90-DU-2076	2076	Till veneer	17	381100	7419500
90-DU-2077	2077	Esker	17	386200	7420000
90-DU-2078	2078	Regotill	17	389300	7415100
90-DU-2079	2079	Marine	17	377100	7409100
90-DU-2080	2080	Till	17	376500	7408100
90-DU-2081	2081	Regotill	17	383900	7406500
90-DU-2082	2082	Till veneer	17	377600	7401900
90-DU-2083	2083	Till	17	382000	7401500
90-DU-2084	2084	Till	17	385300	7403400
90-DU-2085	2085	Till	17	382900	7395100
90-DU-2086	2086	Regotill	17	389700	7403200
90-DU-2087	2087	Regotill	17	388700	7394100
90-DU-2088	2088	Till veneer	17	382700	7389900
90-DU-2089	2089	Marine	17	387300	7382900
90-DU-2090	2090	Marine	17	380300	7385900
90-DU-2091	2091	Marine	17	377600	7388100
90-DU-2092	2092	Till	17	375500	7395200
90-DU-2093	2093	Marine	17	373800	7391900
90-DU-2094	2094	Marine	17	372200	7393000
90-DU-2095	2095	Marine	17	369700	7390700
90-DU-2096	2096	Marine	17	370200	7396900
90-DU-2097	2097	Esker	17	371200	7418100
90-DU-2098	2098	Till veneer	17	378700	7407000
90-DU-2099	2099	Till	17	392300	7431000
90-DU-2100	2100	Till	17	403400	7421900
90-DU-2101	2101	Till	17	402800	7412800
90-DU-2102	2102	Regotill	17	408000	7416600
90-DU-2103	2103	Regotill	17	408000	7408000
90-DU-2104	2104	Regotill	17	403100	7409900
90-DU-2105	2105	Regotill	17	398500	7413600
90-DU-2106	2106	Regotill	17	402100	7403600
90-DU-2107	2107	Till	17	397500	7397000
90-DU-2108	2108	Regotill	17	403000	7395100
90-DU-2109	2109	Till	17	400000	7391900

Appendix A. (cont.)

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2110	2110	Till	17	407600	7393500
90-DU-2111	2111	Marine	17	406200	7384500
90-DU-2112	2112	Marine	17	407300	7381100
90-DU-2113	2113	Marine	17	406000	7380500
90-DU-2114	2114	Till	17	403200	7382500
90-DU-2115	2115	Till	17	395600	7389800
90-DU-2116	2116	Marine	17	390600	7375200
90-DU-2117	2117	Regotill	17	395300	7384200
90-DU-2118	2118	Till	17	395800	7375700
90-DU-2119	2119	Till	17	399900	7373100
90-DU-2120	2120	Till	17	399100	7376300
90-DU-2121	2121	Till	17	395000	7369500
90-DU-2122	2122	Marine	17	391500	7368100
90-DU-2123	2123	Till	17	414000	7431500
90-DU-2124	2124	Till	17	417500	7426500
90-DU-2125	2125	Till veneer	17	422300	7430300
90-DU-2126	2126	Regotill	17	428600	7427700
90-DU-2127	2127	Regotill	17	422300	7425100
90-DU-2128	2128	Till	17	421000	7424000
90-DU-2129	2129	Till	17	425800	7421100
90-DU-2130	2130	Till veneer	17	424100	7419500
90-DU-2131	2131	Regotill	17	421100	7419900
90-DU-2132	2132	Till	17	428000	7411300
90-DU-2133	2133	Till	17	425400	7412800
90-DU-2134	2134	Marine	17	423700	7407100
90-DU-2135	2135	Till veneer	17	421200	7408900
90-DU-2136	2136	Regotill	17	417700	7409100
90-DU-2137	2137	Esker	17	415600	7405600
90-DU-2138	2138	Till	17	415500	7402000
90-DU-2139	2139	Regotill	17	418700	7400300
90-DU-2140	2140	Regotill	17	421500	7403800
90-DU-2141	2141	Regotill	17	426900	7399300
90-DU-2142	2142	Till	17	427000	7395100
90-DU-2143	2143	Marine	17	431300	7392700
90-DU-2144	2144	Marine	17	430800	7389100
90-DU-2145	2145	Marine	17	429400	7390400
90-DU-2146	2146	Marine	17	424700	7390400
90-DU-2147	2147	Till	17	421400	7394000
90-DU-2148	2148	Till	17	420900	7395900
90-DU-2149	2149	Marine	17	418600	7387200
90-DU-2150	2150	Marine	17	416200	7384700
90-DU-2151	2151	Marine	17	411400	7389700
90-DU-2152	2152	Esker	17	411800	7392200
90-DU-2153	2153	Marine	17	400200	7357700
90-DU-2154	2154	Marine	17	401000	7349700
90-DU-2155	2155	Marine	17	403000	7349600
90-DU-2156	2156	Marine	17	410900	7347400
90-DU-2157	2157	Marine	17	410200	7343000
90-DU-2158	2158	Marine	17	412400	7367700
90-DU-2159	2159	Marine	17	433400	7410600
90-DU-2160	2160	Marine	17	434600	7407300
90-DU-2161	2161	Marine	17	436200	7404700
90-DU-2162	2162	Marine	17	447300	7401900
90-DU-2163	2163	Marine	17	447200	7409900
90-DU-2164	2164	Regotill	17	441900	7414900
90-DU-2165	2165	Marine	17	444200	7413800
90-DU-2166	2166	Marine	17	447400	7414800
90-DU-2167	2167	Marine	17	453800	7425400
90-DU-2168	2168	Regotill	17	438700	7428700
90-DU-2169	2169	Regotill	17	437900	7424500
90-DU-2170	2170	Regotill	17	439000	7421800
90-DU-2171	2171	Regotill	17	435200	7420400
90-DU-2172	2172	Regotill	17	437000	7416100
90-DU-2173	2173	Till	17	430300	7419300
90-DU-2174	2174	Marine	17	429300	7415400
90-DU-2175	2175	Till	16	574500	7439400
90-DU-2176	2176	Till	16	577600	7444400
90-DU-2177	2177	Till	16	573400	7450300
90-DU-2178	2178	Till veneer	16	579000	7453200
90-DU-2179	2179	Till veneer	16	575900	7464700
90-DU-2180	2180	Till veneer	16	575500	7466900
90-DU-2181	2181	Regotill	16	574700	7468800

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2182	2182	Regotill	16	578500	7473900
90-DU-2183	2183	Regotill	16	579700	7477500
90-DU-2184	2184	Regotill	16	572600	7477300
90-DU-2185	2185	Regotill	16	574200	7483200
90-DU-2186	2186	Regotill	16	573300	7488100
90-DU-2187	2187	Till	16	581100	7489100
90-DU-2188	2188	Till	16	583400	7491700
90-DU-2189	2189	Till	16	582700	7485200
90-DU-2190	2190	Till veneer	16	589000	7484900
90-DU-2191	2191	Till veneer	16	589100	7480400
90-DU-2192	2192	Regotill	16	587100	7475000
90-DU-2193	2193	Till	16	582700	7470600
90-DU-2194	2194	Till veneer	16	585600	7463300
90-DU-2195	2195	Till	16	587100	7456200
90-DU-2196	2196	Till veneer	16	582300	7452300
90-DU-2197	2197	Till veneer	16	580800	7450000
90-DU-2198	2198	Till veneer	16	587300	7435300
90-DU-2199	2199	Till	16	557000	7428900
90-DU-2200	2200	Till	16	555700	7427400
90-DU-2201	2201	Marine	16	593300	7432900
90-DU-2202	2202	Marine	16	591700	7436800
90-DU-2203	2203	Till veneer	16	588500	7441500
90-DU-2204	2204	Till	16	593900	7445400
90-DU-2205	2205	Till	16	591800	7441100
90-DU-2206	2206	Till veneer	16	592900	7453100
90-DU-2207	2207	Till	16	595000	7459400
90-DU-2208	2208	Till	16	599400	7459000
90-DU-2209	2209	Till	16	598300	7466800
90-DU-2210	2210	Till	16	591300	7472300
90-DU-2211	2211	Till veneer	16	596100	7473700
90-DU-2212	2212	Till veneer	16	594000	7484800
90-DU-2213	2213	Till veneer	16	597100	7489100
90-DU-2214	2214	Till veneer	16	603500	7476800
90-DU-2215	2215	Till veneer	16	601800	7482700
90-DU-2216	2216	Till veneer	16	600200	7491400
90-DU-2217	2217	Till veneer	16	606700	7491400
90-DU-2218	2218	Till	16	605600	7471300
90-DU-2219	2219	Till	16	608400	7458000
90-DU-2220	2220	Till	16	598600	7454200
90-DU-2221	2221	Till	16	600300	7445300
90-DU-2222	2222	Till	16	597600	7440300
90-DU-2223	2223	Till	16	598800	7439200
90-DU-2224	2224	Marine	16	597700	7437400
90-DU-2225	2225	Regotill	16	597800	7444700
90-DU-2226	2226	Regotill	16	545600	7392300
90-DU-2227	2227	Till veneer	16	609100	7438200
90-DU-2228	2228	Till veneer	16	616400	7439700
90-DU-2229	2229	Till veneer	16	615200	7442100
90-DU-2230	2230	Till	16	607000	7447300
90-DU-2231	2231	Till veneer	16	610000	7451800
90-DU-2232	2232	Till	16	615400	7457400
90-DU-2233	2233	Till	16	611600	7461300
90-DU-2234	2234	Till	16	607800	7462400
90-DU-2235	2235	Till veneer	16	615900	7463700
90-DU-2236	2236	Till veneer	16	608500	7471200
90-DU-2237	2237	Till	16	611700	7474000
90-DU-2238	2238	Till veneer	16	609800	7479000
90-DU-2239	2239	Regotill	16	614100	7478700
90-DU-2240	2240	Till veneer	16	616800	7484800
90-DU-2241	2241	Till	16	624000	7488100
90-DU-2242	2242	Till	16	621100	7481900
90-DU-2243	2243	Till	16	620600	7479400
90-DU-2244	2244	Till	16	620400	7473400
90-DU-2245	2245	Till	16	621700	7469400
90-DU-2246	2246	Till veneer	16	624700	7463800
90-DU-2247	2247	Till veneer	16	618700	7462100
90-DU-2248	2248	Till	16	623800	7458300
90-DU-2249	2249	Till veneer	16	618100	7458200
90-DU-2250	2250	Till	16	615800	7454400
90-DU-2251	2251	Till veneer	16	620500	7451600
90-DU-2252	2252	Till veneer	16	620400	7447300
90-DU-2253	2253	Till veneer	16	625200	7447200

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2254	2254	Till veneer	16	624100	7443100
90-DU-2255	2255	Till veneer	16	624600	7442500
90-DU-2256	2256	Till veneer	16	624600	7438400
90-DU-2257	2257	Till veneer	16	616700	7442500
90-DU-2258	2258	Till veneer	16	613600	7439000
90-DU-2259	2259	Till	16	612600	7433200
90-DU-2260	2260	Till veneer	16	556500	7483100
90-DU-2261	2261	Till	16	551200	7487100
90-DU-2262	2262	Esker	16	550800	7488500
90-DU-2263	2263	Esker	16	551500	7489000
90-DU-2264	2264	Till	16	552000	7493700
90-DU-2265	2265	Regotill	16	552600	7498100
90-DU-2266	2266	Till veneer	16	560400	7497300
90-DU-2267	2267	Till	16	554500	7507200
90-DU-2268	2268	Till veneer	16	559700	7513400
90-DU-2269	2269	Till	16	561000	7515500
90-DU-2270	2270	Esker	16	553300	7518800
90-DU-2271	2271	Till veneer	16	555700	7525600
90-DU-2272	2272	Till veneer	16	556300	7530400
90-DU-2273	2273	Esker	16	547400	7536500
90-DU-2274	2274	Esker	16	545200	7536500
90-DU-2275	2275	Marine	16	545200	7539000
90-DU-2276	2276	Till	16	549400	7520400
90-DU-2277	2277	Till	16	546900	7516700
90-DU-2278	2278	Regotill	16	548000	7509500
90-DU-2279	2279	Till	16	546400	7504800
90-DU-2280	2280	Till	16	543000	7497500
90-DU-2281	2281	Till	16	548800	7492300
90-DU-2282	2282	Esker	16	549500	7490700
90-DU-2283	2283	Till	16	548700	7484300
90-DU-2284	2284	Rae till	16	514100	7427000
90-Du-2285	2285	Rae till	16	504500	7424400
90-DU-2286	2286	Rae till	16	501400	7421700
90-DU-2287	2287	Rae till	16	510300	7416500
90-DU-2288	2288	Rae till	16	511800	7409800
90-DU-2289	2289	Rae till	16	502300	7411300
90-DU-2290	2290	Rae till	16	500300	7409100
90-DU-2291	2291	Marine	16	522400	7451800
90-DU-2292	2292	Till	16	529100	7456300
90-DU-2293	2293	Till	16	530100	7458600
90-DU-2294	2294	Till	16	529300	7460000
90-DU-2295	2295	Marine	16	524200	7463600
90-DU-2296	2296	Till	16	529400	7465000
90-DU-2297	2297	Marine	16	525800	7466500
90-DU-2298	2298	Till	16	527200	7469100
90-DU-2299	2299	Marine	16	525200	7470000
90-DU-2300	2300	Marine	16	522700	7470700
90-DU-2301	2301	Marine	16	524100	7474500
90-DU-2302	2302	Marine	16	526200	7474400
90-DU-2303	2303	Marine	16	526900	7483600
90-DU-2304	2304	Marine	16	522400	7487300
90-DU-2305	2305	Marine	16	527100	7486500
90-DU-2306	2306	Esker	16	527900	7485600
90-DU-2307	2307	Marine	16	527000	7496200
90-DU-2308	2308	Marine	16	526000	7497300
90-DU-2309	2309	Till	16	542600	7481900
90-DU-2310	2310	Till veneer	16	539500	7478400
90-DU-2311	2311	Till veneer	16	540200	7473100
90-DU-2312	2312	Till veneer	16	537300	7467500
90-DU-2313	2313	Till veneer	16	538700	7462300
90-DU-2314	2314	Till	16	538200	7456900
90-DU-2315	2315	Till	16	540300	7451300
90-DU-2316	2316	Till veneer	16	538400	7445600
90-DU-2317	2317	Till	16	539300	7439100
90-DU-2318	2318	Till	16	528800	7435200
90-DU-2319	2319	Rae till	16	521300	7414000
90-DU-2320	2320	Rae till	16	513300	7416300
90-DU-2321	2321	Marine	16	532800	7382400
90-DU-2322	2322	Marine	16	532900	7380400
90-DU-2323	2323	Marine	16	532500	7380500
90-DU-2324	2324	Marine	16	532600	7380000
90-DU-2325	2325	Marine	16	533800	7379600

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2326	2326	Marine	16	533400	7380000
90-DU-2327	2327	Marine	16	531700	7381700
90-DU-2328	2328	Marine	16	533200	7378300
90-DU-2329	2329	Till veneer	16	590500	7493100
90-DU-2330	2330	Till veneer	16	598400	7501900
90-DU-2331	2331	Till veneer	16	596300	7505800
90-DU-2332	2332	Till veneer	16	599900	7506100
90-DU-2333	2333	Regotill	16	602300	7508500
90-DU-2334	2334	Till veneer	16	606300	7504000
90-DU-2335	2335	Regotill	16	608300	7509300
90-DU-2336	2336	Till	16	604900	7513600
90-DU-2337	2337	Till	16	598900	7513800
90-DU-2338	2338	Till	16	599900	7516600
90-DU-2339	2339	Till	16	603900	7517600
90-DU-2340	2340	Till	16	600000	7520100
90-DU-2341	2341	Lacustrine	16	600900	7525200
90-DU-2342	2342	Till	16	601300	7532300
90-DU-2343	2343	Regotill	16	599500	7537900
90-DU-2344	2344	Regotill	16	592400	7533800
90-DU-2345	2345	Regotill	16	590800	7538900
90-DU-2346	2346	Regotill	16	582500	7535700
90-DU-2347	2347	Regotill	16	586300	7530100
90-DU-2348	2348	Regotill	16	591300	7528900
90-DU-2349	2349	Regotill	16	595400	7528800
90-DU-2350	2350	Marine	16	524200	7499600
90-DU-2351	2351	Regotill	16	593900	7523700
90-DU-2352	2352	Till veneer	16	594300	7517800
90-DU-2353	2353	Till veneer	16	588500	7519800
90-DU-2354	2354	Till veneer	16	587700	7515900
90-DU-2355	2355	Till	16	585500	7514100
90-DU-2356	2356	Till veneer	16	591500	7511600
90-DU-2357	2357	Till	16	586200	7505200
90-DU-2358	2358	Till veneer	16	591000	7499900
90-DU-2359	2359	Till	16	624900	7497600
90-DU-2360	2360	Regotill	16	622800	7499500
90-DU-2361	2361	Regotill	16	620100	7502900
90-DU-2362	2362	Regotill	16	619300	7498000
90-DU-2363	2363	Regotill	16	613800	7499700
90-DU-2364	2364	Regotill	16	611000	7501600
90-DU-2365	2365	Regotill	16	614300	7505700
90-DU-2366	2366	Regotill	16	623100	7508200
90-DU-2367	2367	Regotill	16	612200	7510900
90-DU-2368	2368	Regotill	16	616700	7511000
90-DU-2369	2369	Regotill	16	617600	7513200
90-DU-2370	2370	Till	16	626000	7512900
90-DU-2371	2371	Till	16	623200	7516400
90-DU-2372	2372	Regotill	16	625900	7517200
90-DU-2373	2373	Regotill	16	620600	7520600
90-DU-2374	2374	Regotill	16	623700	7523000
90-DU-2375	2375	Regotill	16	619800	7526600
90-DU-2376	2376	Regotill	16	624800	7528500
90-DU-2377	2377	Regotill	16	619400	7530000
90-DU-2378	2378	Regotill	16	623200	7533600
90-DU-2379	2379	Regotill	16	618200	7535100
90-DU-2380	2380	Regotill	16	621500	7537400
90-DU-2381	2381	Regotill	16	624000	7540500
90-DU-2382	2382	Regotill	16	625300	7543900
90-DU-2383	2383	Regotill	16	614000	7542400
90-DU-2384	2384	Regotill	16	616700	7537400
90-DU-2385	2385	Regotill	16	616600	7531900
90-DU-2386	2386	Regotill	16	612000	7531800
90-DU-2387	2387	Regotill	16	609600	7529900
90-DU-2388	2388	Regotill	16	607500	7528900
90-DU-2389	2389	Regotill	16	605200	7527000
90-DU-2390	2390	Till	16	608000	7524200
90-DU-2391	2391	Regotill	16	612900	7523300
90-DU-2392	2392	Regotill	16	611600	7515300
90-DU-2393	2393	Regotill	16	609000	7515200
90-DU-2394	2394	Till	16	540900	7490200
90-DU-2395	2395	Till veneer	16	538600	7488700
90-DU-2396	2396	Till	16	534700	7495700
90-DU-2397	2397	Till veneer	16	535800	7496300

Appendix A. (cont.)

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2398	2398	Esker	16	538400	7493600
90-DU-2399	2399	Marine	16	535200	7501600
90-DU-2400	2400	Till veneer	16	538600	7501500
90-DU-2401	2401	Till	16	540000	7504900
90-DU-2402	2402	Till	16	541900	7510000
90-DU-2403	2403	Till	16	535800	7513600
90-DU-2404	2404	Marine	16	532900	7515300
90-DU-2405	2405	Till veneer	16	539700	7519400
90-DU-2406	2406	Till veneer	16	540800	7520800
90-DU-2407	2407	Marine	16	533400	7529200
90-DU-2408	2408	Marine	16	530600	7523400
90-DU-2409	2409	Marine	16	528700	7521100
90-DU-2410	2410	Marine	16	535300	7530700
90-DU-2411	2411	Marine	16	541100	7540900
90-DU-2412	2412	Marine	16	525900	7514500
90-DU-2413	2413	Marine	16	524900	7512900
90-DU-2414	2414	Marine	16	527000	7509600
90-DU-2415	2415	Marine	16	526600	7506000
90-DU-2416	2416	Marine	16	523600	7503000
90-DU-2417	2417	Marine	16	523000	7518400
90-DU-2418	2418	Marine	16	541300	7377300
90-DU-2419	2419	Marine	16	543000	7386200
90-DU-2420	2420	Till	16	546000	7390800
90-DU-2421	2421	Till	16	541100	7396200
90-DU-2422	2422	Rae till	16	538900	7399700
90-DU-2423	2423	Till veneer	16	541500	7401800
90-DU-2424	2424	Till	16	544200	7405500
90-DU-2425	2425	Rae till	16	536900	7392700
90-DU-2426	2426	Rae till	16	532100	7392200
90-DU-2427	2427	Rae till	16	532300	7385900
90-DU-2428	2428	Rae till	16	535300	7384200
90-DU-2429	2429	Rae till	16	537400	7383100
90-DU-2430	2430	Rae till	16	511900	7431000
90-DU-2431	2431	Rae till	16	494500	7434500
90-DU-2432	2432	Rae till	16	497000	7437600
90-DU-2433	2433	Rae till	16	501200	7438800
90-DU-2434	2434	Marine	16	500400	7442700
90-DU-2435	2435	Marine	16	503800	7442100
90-DU-2436	2436	Rae till	16	499200	7446100
90-DU-2437	2437	Marine	16	491000	7443700
90-DU-2438	2438	Marine	16	491800	7443800
90-DU-2439	2439	Marine	16	501200	7450900
90-DU-2440	2440	Marine	16	507400	7455500
90-DU-2441	2441	Marine	16	505200	7465800
90-DU-2442	2442	Marine	16	509400	7469100
90-DU-2443	2443	Marine	16	510300	7475500
90-DU-2444	2444	Esker	16	514600	7461800
90-DU-2445	2445	Marine	16	515500	7459900
90-DU-2446	2446	Marine	16	519900	7464700
90-DU-2447	2447	Marine	16	520400	7460000
90-DU-2448	2448	Till	16	536400	7434200
90-DU-2449	2449	Till	16	544600	7388600
90-DU-2450	2450	Marine	16	551900	7391500
90-DU-2451	2451	Marine	16	547200	7382200
90-DU-2452	2452	Marine	16	550100	7382000
90-DU-2453	2453	Marine	16	552500	7378200
90-DU-2454	2454	Marine	16	560600	7383100
90-DU-2455	2455	Till	16	557900	7392400
90-DU-2456	2456	Marine	16	562500	7397800
90-DU-2457	2457	Regotill	16	559300	7401200
90-DU-2458	2458	Till	16	556200	7396500
90-DU-2459	2459	Regotill	16	552100	7398100
90-DU-2460	2460	Till veneer	16	548900	7403700
90-DU-2461	2461	Till	16	545300	7408500
90-DU-2462	2462	Till veneer	16	607600	7415400
90-DU-2463	2463	Till	16	608400	7410300
90-DU-2464	2464	Regotill	16	607700	7406200
90-DU-2465	2465	Till	16	612600	7405500
90-DU-2466	2466	Regotill	16	616700	7399900
90-DU-2467	2467	Till	16	611300	7399700
90-DU-2468	2468	Till veneer	16	608100	7401300
90-DU-2469	2469	Regotill	16	609100	7399700

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2470	2470	Till	16	607100	7392900
90-DU-2471	2471	Regotill	16	611500	7394500
90-DU-2472	2472	Till	16	609300	7394000
90-DU-2473	2473	Regotill	16	616200	7395400
90-DU-2474	2474	Regotill	16	617700	7389600
90-DU-2475	2475	Till	16	615300	7408400
90-DU-2476	2476	Regotill	16	613600	7388800
90-DU-2477	2477	Regotill	16	607600	7389100
90-DU-2478	2478	Till	16	608800	7382700
90-DU-2479	2479	Regotill	16	614300	7382000
90-DU-2480	2480	Till	16	616400	7379600
90-DU-2481	2481	Regotill	16	621600	7379000
90-DU-2482	2482	Regotill	16	627100	7378000
90-DU-2483	2483	Regotill	16	630700	7377300
90-DU-2484	2484	Regotill	16	625700	7382900
90-DU-2485	2485	Till veneer	16	623900	7386500
90-DU-2486	2486	Till	16	621600	7388500
90-DU-2487	2487	Till	16	622800	7394700
90-DU-2488	2488	Till veneer	16	624100	7395100
90-DU-2489	2489	Marine	16	625300	7399400
90-DU-2490	2490	Till	16	624800	7404000
90-DU-2491	2491	Till	16	622800	7406500
90-DU-2492	2492	Till	16	624000	7410500
90-DU-2493	2493	Till	16	629200	7416200
90-DU-2494	2494	Till	16	620800	7421700
90-DU-2495	2495	Till	16	625700	7424300
90-DU-2496	2496	Till veneer	16	625600	7431800
90-DU-2497	2497	Regotill	16	585400	7380300
90-DU-2498	2498	Regotill	16	586100	7384700
90-DU-2499	2499	Regotill	16	588800	7386500
90-DU-2500	2500	Regotill	16	590700	7385200
90-DU-2501	2501	Till	16	602200	7390200
90-DU-2502	2502	Regotill	16	595900	7391300
90-DU-2503	2503	Regotill	16	599000	7392900
90-DU-2504	2504	Till veneer	16	603000	7396600
90-DU-2505	2505	Till	16	605900	7396500
90-DU-2506	2506	Till	16	604000	7400200
90-DU-2507	2507	Regotill	16	599700	7402200
90-DU-2508	2508	Till	16	596700	7405800
90-DU-2509	2509	Till veneer	16	600100	7407900
90-DU-2510	2510	Regotill	16	608300	7409100
90-DU-2511	2511	Marine	16	601600	7414400
90-DU-2512	2512	Marine	16	601700	7415800
90-DU-2513	2513	Till veneer	16	599500	7419000
90-DU-2514	2514	Till	16	596400	7424900
90-DU-2515	2515	Marine	16	593100	7431400
90-DU-2516	2516	Till	16	590700	7431400
90-DU-2517	2517	Till veneer	16	584100	7429100
90-DU-2518	2518	Marine	16	596000	7416600
90-DU-2519	2519	Till	16	595300	7413700
90-DU-2520	2520	Till	16	594100	7411100
90-DU-2521	2521	Marine	16	586700	7412800
90-DU-2522	2522	Regotill	16	588800	7411000
90-DU-2523	2523	Marine	16	587400	7410200
90-DU-2524	2524	Marine	16	592800	7406800
90-DU-2525	2525	Marine	16	592300	7406000
90-DU-2526	2526	Regotill	16	595800	7402600
90-DU-2527	2527	Regotill	16	596800	7398800
90-DU-2528	2528	Regotill	16	590700	7398400
90-DU-2529	2529	Regotill	16	588300	7400900
90-DU-2530	2530	Esker	16	581800	7399400
90-DU-2531	2531	Marine	16	566900	7392700
90-DU-2532	2532	Marine	16	567400	7396200
90-DU-2533	2533	Till veneer	16	570100	7398600
90-DU-2534	2534	Regotill	16	566400	7400100
90-DU-2535	2535	Esker	16	567000	7402800
90-DU-2536	2536	Regotill	16	565100	7407200
90-DU-2537	2537	Regotill	16	567700	7407900
90-DU-2538	2538	Regotill	16	566000	7412000
90-DU-2539	2539	Till	16	570700	7412700
90-DU-2540	2540	Till veneer	16	567500	7415300
90-DU-2541	2541	Till	16	568200	7421500

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2542	2542	Regotill	16	570300	7423100
90-DU-2543	2543	Till veneer	16	571800	7431900
90-DU-2544	2544	Till veneer	16	576700	7432900
90-DU-2545	2545	Till	16	575400	7423000
90-DU-2546	2546	Till	16	579100	7421000
90-DU-2547	2547	Regotill	16	578700	7414800
90-DU-2548	2548	Till veneer	16	578800	7410900
90-DU-2549	2549	Marine	16	575900	7408900
90-DU-2550	2550	Marine	16	575400	7407900
90-DU-2551	2551	Till veneer	16	575700	7403300
90-DU-2552	2552	Till veneer	16	572000	7394700
90-DU-2553	2553	Till veneer	16	572900	7392700
90-DU-2554	2554	Regotill	16	575200	7387300
90-DU-2555	2555	Till veneer	16	572200	7383000
90-DU-2556	2556	Till	16	577000	7381900
90-DU-2557	2557	Marine	16	575000	7377400
90-DU-2558	2558	Marine	16	576500	7371800
90-DU-2559	2559	Marine	16	582800	7365700
90-DU-2560	2560	Marine	16	576800	7365400
90-DU-2561	2561	Till veneer	16	568300	7490200
90-DU-2562	2562	Till	16	574800	7494800
90-DU-2563	2563	Till	16	580900	7498200
90-DU-2564	2564	Till	16	580000	7500800
90-DU-2565	2565	Till	16	574500	7499000
90-DU-2566	2566	Till	16	575500	7502000
90-DU-2567	2567	Till veneer	16	569100	7504900
90-DU-2568	2568	Till	16	569000	7505600
90-DU-2569	2569	Till	16	578800	7510100
90-DU-2570	2570	Lacustrine	16	577000	7514300
90-DU-2571	2571	Till veneer	16	572000	7514700
90-DU-2572	2572	Till	16	568200	7511200
90-DU-2573	2573	Till	16	568100	7519300
90-DU-2574	2574	Till veneer	16	572300	7519100
90-DU-2575	2575	Esker	16	572300	7521900
90-DU-2576	2576	Regotill	16	566200	7528100
90-DU-2577	2577	Regotill	16	572100	7529300
90-DU-2578	2578	Regotill	16	565700	7538400
90-DU-2579	2579	Regotill	16	569000	7538500
90-DU-2580	2580	Till veneer	16	573400	7541500
90-DU-2581	2581	Regotill	16	580400	7540400
90-DU-2582	2582	Regotill	16	575300	7534700
90-DU-2583	2583	Regotill	16	581200	7527500
90-DU-2584	2584	Till veneer	16	583200	7524700
90-DU-2585	2585	Till veneer	16	579800	7523300
90-DU-2586	2586	Till	16	580700	7517500
90-DU-2587	2587	Till	16	549800	7418000
90-DU-2588	2588	Till	16	555800	7418000
90-DU-2589	2589	Regotill	16	551200	7406700
90-DU-2590	2590	Regotill	16	558600	7407200
90-DU-2591	2591	Regotill	16	555700	7409800
90-DU-2592	2592	Regotill	16	561300	7413000
90-DU-2593	2593	Till	16	561900	7418000
90-DU-2594	2594	Regotill	16	566200	7429600
90-DU-2595	2595	Till	16	564100	7427500
90-DU-2596	2596	Till veneer	16	552600	7424200
90-DU-2597	2597	Regotill	16	560100	7420900
90-DU-2598	2598	Marine	16	581400	7364400
90-DU-2599	2599	Marine	16	582800	7362100
90-DU-2600	2600	Till	16	589100	7363900
90-DU-2601	2601	Till	16	593300	7366300
90-DU-2602	2602	Till	16	594700	7368200
90-DU-2603	2603	Till veneer	16	594900	7362500
90-DU-2604	2604	Till	16	596300	7365100
90-DU-2605	2605	Regotill	16	600600	7365200
90-DU-2606	2606	Marine	16	603000	7364100
90-DU-2607	2607	Marine	16	606500	7365500
90-DU-2608	2608	Regotill	16	619500	7364300
90-DU-2609	2609	Regotill	16	624600	7365300
90-DU-2610	2610	Till	16	615100	7342700
90-DU-2611	2611	Till veneer	16	605200	7352400
90-DU-2612	2612	Marine	16	596900	7350600
90-DU-2613	2613	Marine	16	597400	7356400

Sample	Station	Unit	Zone	Easting	Northing
90-DU-2614	2614	Marine	16	585400	7358700
90-DU-2615	2615	Marine	16	583600	7355000
90-DU-2616	2616	Marine	16	582400	7355300
90-DU-2617	2617	Marine	16	582800	7359900
91-DU-3000	3000	Esker	17	436600	7492200
91-DU-3001	3001	Till	17	435900	7490600
91-DU-3002	3002	Till	17	432400	7493000
91-DU-3003	3003	Till veneer	17	431000	7519500
91-DU-3004	3004	Till	17	457000	7489500
91-DU-3005	3005	Marine	17	478700	7494500
91-DU-3006	3006	Regotill	17	472700	7438000
91-DU-3007	3007	Marine	17	460100	7438400
91-DU-3008	3008	Till	17	444800	7449500
91-DU-3009	3009	Till veneer	17	439200	7499500
91-DU-3010	3010	Till	17	439200	7502300
91-DU-3011	3011	Till	17	439000	7505600
91-DU-3012	3012	Regotill	17	440300	7516300
91-DU-3013	3013	Till	17	438200	7520800
91-DU-3014	3014	Till veneer	17	438700	7529800
91-DU-3015	3015	Till	17	440800	7533700
91-DU-3016	3016	Marine	17	439900	7535600
91-DU-3017	3017	Till	17	439300	7539700
91-DU-3018	3018	Regotill	17	443000	7528000
91-DU-3019	3019	Till	17	444300	7522200
91-DU-3020	3020	Till veneer	17	456800	7522400
91-DU-3021	3021	Regotill	17	449400	7521700
91-DU-3022	3022	Marine	17	457600	7518300
91-DU-3023	3023	Till veneer	17	458200	7515900
91-DU-3024	3024	Till veneer	17	456400	7511200
91-DU-3025	3025	Till veneer	17	452500	7513300
91-DU-3026	3026	Regotill	17	448200	7515700
91-DU-3027	3027	Regotill	17	446700	7510700
91-DU-3028	3028	Till	17	445300	7508200
91-DU-3029	3029	Till	17	454400	7504700
91-DU-3030	3030	Till veneer	17	447400	7500000
91-DU-3031	3031	Till	17	452300	7499700
91-DU-3032	3032	Till veneer	17	452200	7498200
91-DU-3033	3033	Till veneer	17	456600	7494800
91-DU-3034	3034	Till veneer	17	453800	7493700
91-DU-3035	3035	Regotill	17	447400	7495400
91-DU-3036	3036	Till	17	449400	7490500
91-DU-3037	3037	Till	17	398800	7488800
91-DU-3038	3038	Regotill	17	414300	7480200
91-DU-3039	3039	Till	17	409400	7487800
91-DU-3040	3040	Till	17	410800	7487900
91-DU-3041	3041	Till	17	406000	7485100
91-DU-3042	3042	Till	17	403900	7487200
91-DU-3043	3043	Till veneer	17	406700	7489900
91-DU-3044	3044	Till	17	405900	7491300
91-DU-3045	3045	Till	17	400700	7491900
91-DU-3046	3046	Till	17	396800	7486500
91-DU-3047	3047	Regotill	17	401600	7479000
91-DU-3048	3048	Regotill	17	399000	7476900
91-DU-3049	3049	Till	17	396500	7473800
91-DU-3050	3050	Till	17	395800	7471000
91-DU-3051	3051	Regotill	17	397600	7465000
91-DU-3052	3052	Regotill	17	402400	7465300
91-DU-3053	3053	Regotill	17	403600	7459500
91-DU-3054	3054	Regotill	17	402700	7455000
91-DU-3055	3055	Till veneer	17	397700	7457000
91-DU-3056	3056	Till	17	409300	7481300
91-DU-3057	3057	Till	17	416100	7487400
91-DU-3058	3058	Till	17	388900	7489200
91-DU-3059	3059	Till	17	384500	7486900
91-DU-3060	3060	Till	17	383600	7490600
91-DU-3061	3061	Till veneer	17	379900	7488400
91-DU-3062	3062	Till veneer	17	375700	7490300
91-DU-3063	3063	Till	17	373700	7488500
91-DU-3064	3064	Till veneer	17	373800	7483200
91-DU-3065	3065	Till	17	379700	7483800
91-DU-3066	3066	Till veneer	17	382400	7480700
91-DU-3067	3067	Till veneer	17	391100	7483200

Appendix A. (cont.)

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3068	3068	Till veneer	17	386800	7479500
91-DU-3069	3069	Till veneer	17	378700	7474300
91-DU-3070	3070	Till veneer	17	371300	7473000
91-DU-3071	3071	Till	17	370900	7468400
91-DU-3072	3072	Till	17	372400	7467300
91-DU-3073	3073	Till veneer	17	375900	7468000
91-DU-3074	3074	Till veneer	17	371500	7464600
91-DU-3075	3075	Till veneer	17	376700	7463700
91-DU-3076	3076	Till veneer	17	381800	7465100
91-DU-3077	3077	Till veneer	17	378300	7460400
91-DU-3078	3078	Till veneer	17	373800	7459800
91-DU-3079	3079	Till veneer	17	381000	7458100
91-DU-3080	3080	Till veneer	17	372100	7455900
91-DU-3081	3081	Till veneer	17	370700	7449900
91-DU-3082	3082	Till veneer	17	371800	7445800
91-DU-3083	3083	Till	17	370800	7442200
91-DU-3084	3084	Till	17	372500	7439400
91-DU-3085	3085	Till	17	374100	7438800
91-DU-3086	3086	Till	17	377900	7436000
91-DU-3087	3087	Till	17	378900	7438900
91-DU-3088	3088	Till veneer	17	385700	7439000
91-DU-3089	3089	Till veneer	17	389700	7441300
91-DU-3090	3090	Till	17	392000	7446200
91-DU-3091	3091	Till	17	384900	7449000
91-DU-3092	3092	Till	17	380900	7450000
91-DU-3093	3093	Till veneer	17	383000	7453400
91-DU-3094	3094	Till	17	392700	7456300
91-DU-3095	3095	Till veneer	17	387400	7463000
91-DU-3096	3096	Till	17	389900	7463100
91-DU-3097	3097	Till veneer	17	383000	7444800
91-DU-3098	3098	Till veneer	17	389300	7465100
91-DU-3099	3099	Till veneer	17	391200	7468000
91-DU-3100	3100	Regotill	17	391600	7471800
91-DU-3101	3101	Till	17	372300	7494800
91-DU-3102	3102	Till	17	372200	7495800
91-DU-3103	3103	Regotill	17	375100	7501600
91-DU-3104	3104	Regotill	17	377400	750440
91-DU-3105	3105	Regotill	17	377500	7507800
91-DU-3106	3106	Regotill	17	380800	7508600
91-DU-3107	3107	Regotill	17	375800	7509600
91-DU-3108	3108	Regotill	17	378300	7512000
91-DU-3109	3109	Regotill	17	380800	7511700
91-DU-3110	3110	Regotill	17	379200	7514100
91-DU-3111	3111	Till	17	375400	7514400
91-DU-3112	3112	Till	17	374000	7513200
91-DU-3113	3113	Regotill	17	377400	7518000
91-DU-3114	3114	Regotill	17	373800	7518500
91-DU-3115	3115	Regotill	17	379400	7520100
91-DU-3116	3116	Regotill	17	381400	7524600
91-DU-3117	3117	Regotill	17	376300	7526200
91-DU-3118	3118	Regotill	17	384000	7528700
91-DU-3119	3119	Regotill	17	383500	7531500
91-DU-3120	3220	Regotill	17	381900	7533800
91-DU-3121	3221	Regotill	17	375700	7534300
91-DU-3122	3122	Regotill	17	377400	7537900
91-DU-3123	3123	Regotill	17	375200	7537600
91-DU-3124	3124	Regotill	17	374800	7542200
91-DU-3125	3125	Regotill	17	375000	7545200
91-DU-3126	3126	Regotill	17	378500	7545100
91-DU-3127	3127	Regotill	17	381700	7544900
91-DU-3128	3128	Regotill	17	382000	7541600
91-DU-3129	3129	Regotill	17	381900	7540000
91-DU-3130	3130	Regotill	17	382200	7537700
91-DU-3131	3131	Regotill	17	385900	7541400
91-DU-3132	3132	Regotill	17	388500	7540200
91-DU-3133	3133	Regotill	17	388700	7537800
91-DU-3134	3134	Regotill	17	391300	7539200
91-DU-3135	3135	Regotill	17	392800	7538800
91-DU-3136	3136	Regotill	17	394100	7542500
91-DU-3137	3137	Regotill	17	393200	7536700
91-DU-3138	3138	Regotill	17	394100	7533400
91-DU-3139	3139	Regotill	17	388900	7533800

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3140	3140	Regotill	17	386200	7530900
91-DU-3141	3141	Regotill	17	386400	7528700
91-DU-3142	3142	Regotill	17	382000	7527400
91-DU-3143	3143	Regotill	17	393500	7523400
91-DU-3144	3144	Regotill	17	391900	7521400
91-DU-3145	3145	Regotill	17	387300	7520300
91-DU-3146	3146	Till	17	383900	7511900
91-DU-3147	3147	Till veneer	17	389300	7514200
91-DU-3148	3148	Till	17	392400	7515200
91-DU-3149	3149	Till veneer	17	393200	7512200
91-DU-3150	3150	Regotill	17	393300	7510200
91-DU-3151	3151	Till	17	391500	7508400
91-DU-3152	3152	Till	17	385900	7505800
91-DU-3153	3153	Till veneer	17	384400	7503600
91-DU-3154	3154	Regotill	17	388700	7502600
91-DU-3155	3155	Till	17	385900	7499200
91-DU-3156	3156	Regotill	17	392100	7499000
91-DU-3157	3157	Till veneer	17	384400	7494800
91-DU-3158	3158	Till	17	396000	7449100
91-DU-3159	3159	Till	17	393200	7437700
91-DU-3160	3160	Till	17	393000	743500
91-DU-3161	3161	Till	17	403200	7433500
91-DU-3162	3162	Till	17	407300	7435000
91-DU-3163	3163	Till	17	409100	7435900
91-DU-3164	3164	Till	17	410300	7434400
91-DU-3165	3165	Till	17	410400	7440400
91-DU-3166	3166	Till	17	410200	7443300
91-DU-3167	3167	Till	17	404300	7443500
91-DU-3168	3168	Till	17	406000	7447800
91-DU-3169	3169	Regotill	17	409400	7451200
91-DU-3170	3170	Regotill	17	407500	7453300
91-DU-3171	3171	Regotill	17	413100	7452000
91-DU-3172	3172	Till	17	411600	7456100
91-DU-3173	3173	Till	17	409500	7458700
91-DU-3174	3174	Regotill	17	410800	7460000
91-DU-3175	3175	Regotill	17	412000	7464500
91-DU-3176	3176	Regotill	17	406500	7467100
91-DU-3177	3177	Regotill	17	409800	7469700
91-DU-3178	3178	Regotill	17	406100	7470700
91-DU-3179	3179	Regotill	17	411000	7470600
91-DU-3180	3180	Regotill	17	409900	7474900
91-DU-3181	3181	Till	17	461300	7487000
91-DU-3182	3182	Till veneer	17	460500	7490800
91-DU-3183	3183	Till	17	462200	7495300
91-DU-3184	3184	Till veneer	17	465800	7495900
91-DU-3185	3185	Esker	17	460100	7497300
91-DU-3186	3186	Till	17	462400	7500000
91-DU-3187	3187	Regotill	17	464600	7501800
91-DU-3188	3188	Till veneer	17	463800	7508500
91-DU-3189	3189	Marine	17	461000	7518900
91-DU-3190	3190	Marine	17	466200	7514200
91-DU-3191	3191	Marine	17	472200	7504900
91-DU-3192	3192	Till	17	468800	7504800
91-DU-3193	3193	Till veneer	17	470100	7499400
91-DU-3194	3194	Marine	17	476700	7499900
91-DU-3195	3195	Marine	17	482900	7496900
91-DU-3196	3196	Marine	17	485100	7490200
91-DU-3197	3197	Marine	17	479200	7489300
91-DU-3198	3198	Marine	17	477000	7487500
91-DU-3199	3199	Marine	17	473400	7489200
91-DU-3200	3200	Till veneer	17	471600	7489400
91-DU-3201	3201	Marine	17	472700	7493500
91-DU-3202	3202	Regotill	17	444800	7487800
91-DU-3203	3203	Till	17	447500	7484500
91-DU-3204	3204	Regotill	17	442900	7484400
91-DU-3205	3205	Regotill	17	435900	7493300
91-DU-3206	3206	Till	17	437000	7478500
91-DU-3207	3207	Till	17	398600	7494300
91-DU-3208	3208	Regotill	17	397000	7498600
91-DU-3209	3209	Regotill	17	395700	7503900
91-DU-3210	3210	Regotill	17	397900	7506400
91-DU-3211	3211	Regotill	17	397800	7509600

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3213	3213	Till	17	398400	7513000
91-DU-3214	3214	Regotill	17	396800	7530600
91-DU-3215	3215	Regotill	17	398000	7535800
91-DU-3216	3216	Regotill	17	401100	7539400
91-DU-3217	3217	Regotill	17	400500	7542700
91-DU-3218	3218	Regotill	17	398800	7544100
91-DU-3219	3219	Regotill	17	399400	7544400
91-DU-3220	3220	Regotill	17	412300	7540100
91-DU-3221	3221	Regotill	17	407900	7536300
91-DU-3222	3222	Till	17	409600	7532700
91-DU-3223	3223	Till	17	407400	7530000
91-DU-3224	3224	Till veneer	17	412800	7527400
91-DU-3225	3225	Till	17	413000	7525600
91-DU-3226	3226	Till veneer	17	410100	7523500
91-DU-3227	3227	Till	17	407600	7524800
91-DU-3228	3228	Regotill	17	403100	7524900
91-DU-3229	3229	Regotill	17	405100	7518000
91-DU-3230	3230	Regotill	17	412300	7520200
91-DU-3231	3231	Regotill	17	413200	7515200
91-DU-3232	3232	Regotill	17	413800	7512600
91-DU-3233	3233	Regotill	17	408000	7514100
91-DU-3234	3234	Regotill	17	406700	7509500
91-DU-3235	3235	Regotill	17	406900	7502800
91-DU-3236	3236	Regotill	17	413300	7504000
91-DU-3237	3237	Till	17	406100	7497700
91-DU-3238	3238	Till	17	408500	7498200
91-DU-3239	3239	Till	17	413400	7500400
91-DU-3240	3240	Till	17	413700	7496500
91-DU-3241	3241	Till veneer	17	418700	7498800
91-DU-3242	3242	Regotill	17	415400	7505700
91-DU-3243	3243	Till	17	420100	7505100
91-DU-3244	3244	Regotill	17	418300	7508200
91-DU-3245	3245	Regotill	17	418500	7515000
91-DU-3246	3246	Regotill	17	420400	7518200
91-DU-3247	3247	Till	17	420400	7521100
91-DU-3248	3248	Till	17	421800	7528000
91-DU-3249	3249	Till	17	424000	7530400
91-DU-3250	3250	Till	17	418700	7532600
91-DU-3251	3251	Till	17	416200	7534400
91-DU-3252	3252	Till veneer	17	421500	7538600
91-DU-3253	3253	Till	17	423200	7542200
91-DU-3254	3254	Till	17	434200	7540200
91-DU-3255	3255	Till	17	430500	7534900
91-DU-3256	3256	Till	17	433900	7531700
91-DU-3257	3257	Till	17	431500	7531200
91-DU-3258	3258	Till	17	426000	7528800
91-DU-3259	3259	Regotill	17	427100	7524800
91-DU-3260	3260	Regotill	17	431500	7525900
91-DU-3261	3261	Regotill	17	431400	7522100
91-DU-3262	3262	Regotill	17	437500	7523600
91-DU-3263	3263	Regotill	17	425000	7518900
91-DU-3264	3264	Regotill	17	424800	7516100
91-DU-3265	3265	Regotill	17	429800	7513800
91-DU-3266	3266	Regotill	17	435000	7514400
91-DU-3267	3267	Regotill	17	434500	7508800
91-DU-3268	3268	Regotill	17	427200	7510800
91-DU-3269	3269	Regotill	17	424000	7510900
91-DU-3270	3270	Till	17	462400	7484600
91-DU-3271	3271	Regotill	17	470300	7481800
91-DU-3272	3272	Till	17	473100	7479000
91-DU-3273	3273	Marine	17	477700	7481500
91-DU-3274	3274	Marine	17	477900	7477600
91-DU-3275	3275	Till	17	471400	7470200
91-DU-3276	3276	Regotill	17	477900	7472600
91-DU-3277	3277	Till veneer	17	475500	7465300
91-DU-3278	3278	Marine	17	478400	7462900
91-DU-3279	3279	Till	17	475300	7457900
91-DU-3279	3280	Till	17	471300	7459200
91-DU-3281	3281	Till	17	471400	7452200
91-DU-3282	3282	Till	17	470200	7442500
91-DU-3283	3283	Regotill	17	473600	7440900
91-DU-3284	3284	Till	17	476200	7437500

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3285	3285	Marine	17	470500	7431500
91-DU-3286	3286	Regotill	17	467400	7435400
91-DU-3287	3287	Marine	17	464600	7434600
91-DU-3288	3288	Marine	17	460000	7433000
91-DU-3289	3289	Marine	17	456900	7434300
91-DU-3290	3290	Regotill	17	463100	7440900
91-DU-3291	3291	Regotill	17	466600	7444000
91-DU-3292	3292	Till	17	460300	7443800
91-DU-3293	3293	Regotill	17	465100	7449000
91-DU-3294	3294	Till	17	466700	7452600
91-DU-3295	3295	Till	17	462700	7452900
91-DU-3296	3296	Till	17	458400	7449900
91-DU-3297	3297	Till veneer	17	465100	7459500
91-DU-3298	3298	Regotill	17	457900	7459600
91-DU-3299	3299	Till	17	458100	7462400
91-DU-3300	3300	Regotill	17	463800	7468900
91-DU-3301	3301	Regotill	17	464900	7472700
91-DU-3302	3302	Regotill	17	459700	7474800
91-DU-3303	3303	Regotill	17	465400	7478800
91-DU-3304	3304	Regotill	17	465000	7484800
91-DU-3305	3305	Till	17	458100	7483900
91-DU-3306	3306	Regotill	17	416300	7455800
91-DU-3307	3307	Regotill	17	421700	7455300
91-DU-3308	3308	Till veneer	17	418400	7450400
91-DU-3309	3309	Till	17	414500	7446900
91-DU-3310	3310	Regotill	17	420400	7445000
91-DU-3311	3311	Regotill	17	416300	7442800
91-DU-3312	3312	Till	17	415100	7437500
91-DU-3313	3313	Regotill	17	416600	7437900
91-DU-3314	3314	Regotill	17	422100	7432500
91-DU-3315	3315	Regotill	17	423800	7439000
91-DU-3316	3316	Regotill	17	426700	7436700
91-DU-3317	3317	Regotill	17	432400	7432900
91-DU-3318	3318	Till	17	428200	7438000
91-DU-3319	3319	Regotill	17	428600	7413300
91-DU-3320	3320	Till veneer	17	429600	7445800
91-DU-3321	3321	Till	17	433400	7449600
91-DU-3322	3322	Regotill	17	428500	7450700
91-DU-3323	3323	Till	17	426200	7450300
91-DU-3324	3324	Till	17	433200	7452500
91-DU-3325	3325	Regotill	17	431200	7456000
91-DU-3326	3326	Regotill	17	433600	7457400
91-DU-3327	3327	Regotill	17	426500	7459900
91-DU-3328	3328	Regotill	17	428200	7462100
91-DU-3329	3329	Regotill	17	431900	7462000
91-DU-3330	3330	Regotill	17	432100	7467300
91-DU-3331	3331	Regotill	17	427000	7466200
91-DU-3332	3332	Till	17	426900	7469800
91-DU-3333	3333	Till	17	428500	7474500
91-DU-3334	3334	Regotill	17	427700	7475200
91-DU-3335	3335	Till	17	428100	7478600
91-DU-3336	3336	Regotill	17	422500	7434100
91-DU-3337	3337	Till	17	424100	7486800
91-DU-3338	3338	Till	17	420700	7486300
91-DU-3339	3339	Marine	17	479100	7436200
91-DU-3340	3340	Marine	17	481800	743700
91-DU-3341	3341	Till	17	479000	7441800
91-DU-3342	3342	Till veneer	17	478300	7444400
91-DU-3343	3343	Marine	17	477900	7446600
91-DU-3344	3344	Marine	17	482800	7453900
91-DU-3345	3345	Marine	17	483100	7457600
91-DU-3346	3346	Marine	17	483900	7467000
91-DU-3347	3347	Till veneer	17	473500	7459800
91-DU-3348	3348	Till	17	472700	7459000
91-DU-3349	3349	Till	17	474200	7466000
91-DU-3350	3350	Regotill	17	473900	7471300
91-DU-3351	3351	Marine	17	482200	7470600
91-DU-3352	3352	Marine	17	486600	7481700
91-DU-3353	3353	Marine	17	490700	7481700
91-DU-3354	3354	Marine	17	487000	7484100
91-DU-3355	3355	Till	17	444400	7471800
91-DU-3356	3356	Regotill	17	441700	7478900

Appendix A. (cont.)

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3357	3357	Till	17	436900	74788500
91-DU-3358	3358	Esker	17	444100	7469900
91-DU-3359	3359	Regotill	17	436100	7465000
91-DU-3360	3360	Regotill	17	435600	7462000
91-DU-3361	3361	Regotill	17	439300	7462200
91-DU-3362	3362	Regotill	17	442300	7463500
91-DU-3363	3363	Regotill	17	440100	7457300
91-DU-3364	3364	Till veneer	17	443400	7453600
91-DU-3365	3365	Till	17	436700	7443200
91-DU-3366	3366	Regotill	17	434700	7438700
91-DU-3367	3367	Regotill	17	436800	7433100
91-DU-3368	3368	Regotill	17	437500	7435500
91-DU-3369	3369	Regotill	17	440800	7439100
91-DU-3370	3370	Regotill	17	440700	7436800
91-DU-3371	3371	Regotill	17	444500	7435100
91-DU-3372	3372	Till	17	446100	7437900
91-DU-3373	3373	Till	17	445300	7441600
91-DU-3374	3374	Regotill	17	448200	7435500
91-DU-3375	3375	Marine	17	452500	7431900
91-DU-3376	3376	Till	17	452100	7437000
91-DU-3377	3377	Till	17	450300	7437800
91-DU-3378	3378	Till	17	453300	7443100
91-DU-3379	3379	Till veneer	17	455600	7447100
91-DU-3380	3380	Till	17	453100	7446700
91-DU-3381	3381	Till	17	450500	7450600
91-DU-3382	3382	Till	17	447800	7455500
91-DU-3383	3383	Till	17	454500	7459100
91-DU-3384	3384	Till	17	450000	7460200
91-DU-3385	3385	Regotill	17	448900	7464500
91-DU-3386	3386	Regotill	17	453400	7465600
91-DU-3387	3387	Till	17	455000	7473000
91-DU-3388	3388	Till	17	451900	7475100
91-DU-3389	3389	Till veneer	17	448600	7472900
91-DU-3390	3390	Till	17	451700	7480600
91-DU-3391	3391	Till	17	452700	7487300
91-DU-3392	3392	Till	17	426300	7508100
91-DU-3393	3393	Till	17	924900	7504800
91-DU-3394	3394	Till veneer	17	424700	7501400
91-DU-3395	3395	Till	17	429700	7503200
91-DU-3396	3396	Till	17	432700	7499700
91-DU-3397	3397	Till	17	430200	7497900
91-DU-3398	3398	Till	17	427600	7497600
91-DU-3399	3399	Till	17	431600	7495500
91-DU-3400	3400	Till veneer	17	430200	7489700
91-DU-3401	3401	Till	17	426800	7491000
91-DU-3402	3402	Till	17	419400	7494900
91-DU-3403	3403	Till	17	421200	7490200
91-DU-3404	3404	Till	17	415600	7483400
91-DU-3405	3405	Till	17	419800	7476900
91-DU-3406	3406	Regotill	17	415500	7476200
91-DU-3407	3407	Till	17	422500	7475900
91-DU-3408	3408	Regotill	17	415000	7470500
91-DU-3409	3409	Till	17	419500	7469900
91-DU-3410	3410	Regotill	17	414500	7465100
91-DU-3411	3411	Regotill	17	418800	7460700
91-DU-3412	3412	Regotill	17	423500	7460800
91-DU-3413	3413	Till	17	427200	7484400
91-DU-3414	3414	Till	17	366800	7377700
91-DU-3415	3415	Regotill	17	366700	7369800
91-DU-3416	3416	Marine	17	370300	7364600
91-DU-3417	3417	Till	17	367700	7358200
91-DU-3418	3418	Till	17	369500	7354500
91-DU-3419	3419	Till	17	377100	7345900
91-DU-3420	3420	Marine	17	372500	7347900

Sample	Station	Unit	Zone	Easting	Northing
91-DU-3421	3421	Marine	17	369500	7350200
91-DU-3422	3422	Marine	16	632300	7359500
91-DU-3423	3423	Regotill	16	633600	7363300
91-DU-3424	3424	Regotill	16	629900	7369000
91-DU-3425	3425	Regotill	16	625600	7372000
91-DU-3426	3426	Regotill	16	614100	7373100
91-DU-3427	3427	Till	16	612600	7377600
91-DU-3428	3428	Till	16	606400	7373800
91-DU-3429	3429	Marine	16	608500	7367700
91-DU-3430	3430	Till	16	600500	7373800
91-DU-3431	3431	Regotill	16	590200	7370600
91-DU-3432	3432	Regotill	16	592000	7389600
91-DU-3433	3433	Regotill	16	597400	7386600
91-DU-3434	3434	Till	16	602000	7387200
91-DU-3435	3435	Regotill	16	603300	7382200
91-DU-3436	3436	Till veneer	16	625500	7392900
91-DU-3437	3437	Till veneer	16	625900	7396400
91-DU-3438	3438	Regotill	17	406100	7470700
91-DU-3439	3439	Regotill	17	410500	7466700
91-DU-3440	3440	Regotill	17	411100	7460800
91-DU-3441	3441	Till	17	419500	7449600
91-DU-3442	3442	Regotill	17	427200	7444600
91-DU-3443	3443	Regotill	17	430500	7447600
91-DU-3444	3444	Till	17	454800	7459700
91-DU-3445	3445	Regotill	17	441900	7478500
91-DU-3446	3446	Till	17	427100	7478200
91-DU-3447	3447	Till veneer	17	396700	7497100
91-DU-3448	3448	Till veneer	17	384400	7487300
91-DU-3449	3449	Till	17	375300	7487200
91-DU-3450	3450	Till	17	380800	7477500
91-DU-3451	3451	Till veneer	17	381500	7471500
91-DU-3452	3452	Till	17	378000	7466400
91-DU-3453	3453	Till veneer	17	371000	7454600
91-DU-3454	3454	Till veneer	17	373100	7442800
91-DU-3455	3455	Till	17	382000	7440300
91-DU-3456	3456	Till veneer	17	382300	7453500
91-DU-3457	3457	Till	17	392400	7456000
91-DU-3458	3458	Regotill	17	396800	7468500
91-DU-3459	3459	Till veneer	17	390700	7469300
91-DU-3460	3460	Marine	16	525000	7528000
91-DU-3461	3461	Marine	16	519400	7541200
91-DU-3462	3462	Marine	16	524600	7539800
91-DU-3462	3463	Marine	16	521500	7556000
91-DU-3464	3464	Marine	16	519200	7559100
91-DU-3465	3465	Marine	16	523100	7565300
91-DU-3466	3466	Marine	16	514400	7572600
91-DU-3467	3467	Marine	16	511800	7569400
91-DU-3468	3468	Marine	16	510400	7562500
91-DU-3469	3469	Marine	16	513100	7557000
91-DU-3470	3470	Marine	16	508100	7555800
91-DU-3471	3471	Marine	16	505400	7559000
91-DU-3472	3472	Marine	16	508300	7554000
91-DU-3473	3473	Marine	16	511500	7546000
91-DU-3474	3474	Marine	16	510900	7537300
91-DU-3475	3475	Marine	16	514500	7536300
91-DU-3476	3476	Marine	16	515300	7531200
91-DU-3477	3477	Marine	16	506700	7532900
91-DU-3478	3478	Marine	16	506600	7524000
91-DU-3479	3479	Marine	16	510900	7520000
91DU-3480	3480	Marine	16	517300	7518700
91DU-3481	3481	Marine	16	518100	7512800
91DU-3482	3482	Marine	16	523100	7518900
91DU-3483	3483	Till	17	466100	7454600
91DU-3484	3484	Till	17	466500	7453200

Appendix B

Texture of samples.

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
No sample	1009	–	–	–	–
88-DU-1016	1010	–	–	–	–
88-DU-1015	1011	–	–	–	–
88-DU-1033	1012	–	–	–	–
88-DU-1121	1115	–	–	–	–
No sample	1696	–	–	–	–
No sample	1697	–	–	–	–
No sample	1698	–	–	–	–
No sample	1699	–	–	–	–
No sample	1800	–	–	–	–
No sample	1801	–	–	–	–
No sample	1802	–	–	–	–
88-DU-1432	1803	–	–	–	–
No sample	1804	–	–	–	–
No sample	1805	–	–	–	–
No sample	1806	–	–	–	–
88-DU-1262	1807	–	–	–	–
88-DU-1430	1808	–	–	–	–
No sample	1809	–	–	–	–
88-DU-1433	1810	–	–	–	–
No sample	1811	–	–	–	–
90-DU-2001	2001	6	60	30	4
90-DU-2002	2002	–	–	–	–
90-DU-2003	2003	8	77	14	1
90-DU-2004	2004	–	–	–	–
90-DU-2005	2005	–	–	–	–
90-DU-2006	2006	7	75	17	1
90-DU-2007	2007	3	38	39	20
90-DU-2008	2008	4	48	33	15
90-DU-2009	2009	3	22	49	26
90-DU-2010	2010	4	58	35	3
90-DU-2011	2011	5	57	30	8
90-DU-2012	2012	8	57	29	6
90-DU-2013	2013	6	76	14	4
90-DU-2014	2014	–	–	–	–
90-DU-2015	2015	–	–	–	–
90-DU-2016	2016	–	–	–	–
90-DU-2017	2017	–	–	–	–
90-DU-2018	2018	2	23	55	20
90-DU-2019	2019	7	49	34	10
90-DU-2020	2020	1	14	65	20
90-DU-2021	2021	–	–	–	–
90-DU-2022	2022	–	–	–	–
90-DU-2023	2023	4	44	34	18
90-DU-2024	2024	–	–	–	–
90-DU-2025	2025	4	54	34	8
90-DU-2026	2026	–	–	–	–
90-DU-2027	2027	–	–	–	–
90-DU-2028	2028	6	47	34	13
90-DU-2029	2029	5	65	26	4
90-DU-2030	2030	–	–	–	–
90-DU-2031	2031	–	–	–	–
90-DU-2032	2032	4	30	48	18
90-DU-2032	2032	4	64	28	4
90-DU-2033	2033	–	–	–	–
90-DU-2034	2034	–	–	–	–
90-DU-2035	2035	–	–	–	–
90-DU-2036	2036	6	75	18	1
90-DU-2037	2037	–	–	–	–
90-DU-2038	2038	–	–	–	–
90-DU-2039	2039	5	48	33	14
90-DU-2040	2040	–	–	–	–
90-DU-2041	2041	5	54	30	11
90-DU-2042	2042	5	55	31	9
90-DU-2043	2043	5	45	37	13
90-DU-2044	2044	7	63	25	5
90-DU-2045	2045	2	49	46	3
90-DU-2046	2046	4	47	41	8
90-DU-2047	2047	6	63	25	6
90-DU-2048	2048	8	67	24	1
90-DU-2049	2049	–	–	–	–
90-DU-2050	2050	6	54	37	3
90-DU-2051	2051	5	49	42	4
90-DU-2052	2052	5	57	34	4
90-DU-2053	2053	8	54	37	1
90-DU-2054	2054	6	52	29	13
90-DU-2055	2055	4	51	27	18
90-DU-2056	2056	6	57	27	10
90-DU-2057	2057	4	56	34	6
90-DU-2058	2058	4	44	35	17
90-DU-2059	2059	–	–	–	–
90-DU-2060	2060	–	–	–	–
90-DU-2061	2061	4	54	30	12
90-DU-2062	2062	–	–	–	–
90-DU-2063	2063	5	56	38	1
90-DU-2064	2064	8	63	21	8
90-DU-2065	2065	–	–	–	–
90-DU-2066	2066	8	49	35	8
90-DU-2067	2067	3	51	42	4
90-DU-2068	2068	3	50	37	10
90-DU-2069	2069	–	–	–	–
90-DU-2070	2070	4	38	32	26
90-DU-2071	2071	–	–	–	–
90-DU-2072	2072	6	64	25	5
90-DU-2073	2073	8	59	29	4
90-DU-2074	2074	7	63	21	9
90-DU-2075	2075	7	59	24	10
90-DU-2076	2076	6	65	24	5
90-DU-2077	2077	–	–	–	–
90-DU-2078	2078	7	69	23	1
90-DU-2079	2079	–	–	–	–
90-DU-2080	2080	5	68	25	2
90-DU-2081	2081	6	58	34	2
90-DU-2082	2082	–	–	–	–
90-DU-2083	2083	–	–	–	–
90-DU-2084	2084	–	–	–	–
90-DU-2085	2085	–	–	–	–
90-DU-2086	2086	5	67	20	8
90-DU-2087	2087	5	60	28	7
90-DU-2088	2088	17	78	4	1
90-DU-2089	2089	6	51	30	13
90-DU-2090	2090	17	76	5	2
90-DU-2091	2091	–	–	–	–
90-DU-2092	2092	6	60	25	9
90-DU-2093	2093	–	–	–	–
90-DU-2094	2094	1	26	51	22
90-DU-2095	2095	–	–	–	–
90-DU-2096	2096	–	–	–	–
90-DU-2097	2097	–	–	–	–
90-DU-2098	2098	–	–	–	–
90-DU-2099	2099	7	59	22	12
90-DU-2100	2100	–	–	–	–
90-DU-2101	2101	5	66	19	10
90-DU-2102	2102	8	79	9	4
90-DU-2103	2103	–	–	–	–
90-DU-2104	2104	–	–	–	–

– No data available

Appendix B. (cont.)

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2105	2105	8	77	13	2
90-DU-2106	2106	7	54	31	8
90-DU-2107	2107	6	63	21	10
90-DU-2108	2108	5	60	32	2
90-DU-2109	2109	–	–	–	–
90-DU-2110	2110	5	55	35	5
90-DU-2111	2111	–	–	–	–
90-DU-2112	2112	–	–	–	–
90-DU-2113	2113	–	–	–	–
90-DU-2114	2114	8	56	35	1
90-DU-2115	2115	4	54	27	15
90-DU-2116	2116	4	34	42	20
90-DU-2117	2117	–	–	–	–
90-DU-2118	2118	6	52	40	2
90-DU-2119	2119	9	61	29	1
90-DU-2120	2120	–	–	–	–
90-DU-2121	2121	–	–	–	–
90-DU-2122	2122	–	–	–	–
90-DU-2123	2123	7	62	25	6
90-DU-2124	2124	–	–	–	–
90-DU-2125	2125	12	77	8	3
90-DU-2126	2126	14	80	4	2
90-DU-2127	2127	–	–	–	–
90-DU-2128	2128	5	55	30	10
90-DU-2129	2129	–	–	–	–
90-DU-2130	2130	–	–	–	–
90-DU-2131	2131	8	58	31	3
90-DU-2132	2132	5	48	42	5
90-DU-2133	2133	–	–	–	–
90-DU-2134	2134	–	–	–	–
90-DU-2135	2135	5	59	27	9
90-DU-2136	2136	–	–	–	–
90-DU-2137	2137	–	–	–	–
90-DU-2138	2138	–	–	–	–
90-DU-2139	2139	5	52	38	5
90-DU-2140	2140	5	55	38	2
90-DU-2141	2141	4	47	42	7
90-DU-2142	2142	7	59	32	2
90-DU-2143	2143	–	–	–	–
90-DU-2144	2144	–	–	–	–
90-DU-2145	2145	–	–	–	–
90-DU-2146	2146	9	48	39	4
90-DU-2147	2147	–	–	–	–
90-DU-2148	2148	4	50	43	3
90-DU-2149	2149	8	87	4	1
90-DU-2150	2150	–	–	–	–
90-DU-2151	2151	–	–	–	–
90-DU-2152	2152	–	–	–	–
90-DU-2153	2153	–	–	–	–
90-DU-2154	2154	–	–	–	–
90-DU-2155	2155	6	37	42	15
90-DU-2155	2155	16	79	4	1
90-DU-2156	2156	12	67	17	4
90-DU-2157	2157	–	–	–	–
90-DU-2158	2158	–	–	–	–
90-DU-2159	2159	8	60	24	8
90-DU-2160	2160	–	–	–	–
90-DU-2161	2161	–	–	–	–
90-DU-2162	2162	–	–	–	–
90-DU-2163	2163	–	–	–	–
90-DU-2164	2164	12	72	14	2
90-DU-2165	2165	–	–	–	–
90-DU-2166	2166	–	–	–	–
90-DU-2167	2167	–	–	–	–
90-DU-2168	2168	8	78	13	1
90-DU-2169	2169	15	76	7	2
90-DU-2170	2170	6	59	34	1
90-DU-2171	2171	8	76	13	3
90-DU-2172	2172	9	56	29	6

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2173	2173	5	56	33	6
90-DU-2174	2174	–	–	–	–
90-DU-2175	2175	5	50	30	15
90-DU-2176	2176	4	48	35	13
90-DU-2177	2177	3	50	33	14
90-DU-2178	2178	5	51	26	18
90-DU-2179	2179	4	52	29	15
90-DU-2180	2180	–	–	–	–
90-DU-2181	2181	4	53	32	11
90-DU-2182	2182	–	–	–	–
90-DU-2183	2183	4	62	26	8
90-DU-2184	2184	5	63	23	9
90-DU-2185	2185	7	52	39	2
90-DU-2186	2186	7	65	26	2
90-DU-2187	2187	–	–	–	–
90-DU-2188	2188	6	59	10	25
90-DU-2189	2189	–	–	–	–
90-DU-2190	2190	6	51	26	17
90-DU-2191	2191	6	59	28	7
90-DU-2192	2192	8	73	18	1
90-DU-2193	2193	–	–	–	–
90-DU-2194	2194	–	–	–	–
90-DU-2195	2195	5	53	30	12
90-DU-2196	2196	6	49	32	13
90-DU-2197	2197	5	52	28	15
90-DU-2198	2198	6	55	27	12
90-DU-2199	2199	8	59	23	10
90-DU-2200	2200	4	54	35	7
90-DU-2201	2201	7	66	20	7
90-DU-2202	2202	7	52	28	13
90-DU-2203	2203	6	51	31	12
90-DU-2204	2204	6	54	29	11
90-DU-2205	2205	7	59	24	10
90-DU-2206	2206	5	53	29	13
90-DU-2207	2207	4	54	29	13
90-DU-2208	2208	–	–	–	–
90-DU-2209	2209	6	55	27	12
90-DU-2210	2210	5	56	30	9
90-DU-2211	2211	6	56	25	13
90-DU-2212	2212	–	–	–	–
90-DU-2213	2213	8	60	31	1
90-DU-2214	2214	3	54	42	1
90-DU-2215	2215	–	–	–	–
90-DU-2216	2216	–	–	–	–
90-DU-2217	2217	7	62	26	5
90-DU-2218	2218	6	59	24	11
90-DU-2219	2219	6	54	24	16
90-DU-2220	2220	5	54	28	13
90-DU-2221	2221	8	79	11	2
90-DU-2221	2221	12	51	23	14
90-DU-2222	2222	–	–	–	–
90-DU-2223	2223	7	55	27	11
90-DU-2224	2224	–	–	–	–
90-DU-2225	2225	5	60	25	10
90-DU-2226	2226	5	56	28	11
90-DU-2227	2227	6	56	27	11
90-DU-2228	2228	–	–	–	–
90-DU-2229	2229	8	56	27	9
90-DU-2230	2230	10	58	23	9
90-DU-2231	2231	7	51	28	14
90-DU-2232	2232	–	–	–	–
90-DU-2233	2233	7	54	25	14
90-DU-2234	2234	–	–	–	–
90-DU-2235	2235	12	61	25	2
90-DU-2236	2236	–	–	–	–
90-DU-2237	2237	7	56	25	12
90-DU-2238	2238	–	–	–	–
90-DU-2239	2239	–	–	–	–
90-DU-2240	2240	6	56	24	14

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2241	2241	5	55	25	15
90-DU-2242	2242	–	–	–	–
90-DU-2243	2243	–	–	–	–
90-DU-2244	2244	7	57	23	13
90-DU-2245	2245	7	63	20	10
90-DU-2246	2246	–	–	–	–
90-DU-2247	2247	–	–	–	–
90-DU-2248	2248	8	62	26	4
90-DU-2249	2249	–	–	–	–
90-DU-2250	2250	5	56	26	13
90-DU-2251	2251	–	–	–	–
90-DU-2252	2252	9	62	23	6
90-DU-2253	2253	–	–	–	–
90-DU-2254	2254	11	64	16	9
90-DU-2255	2255	–	–	–	–
90-DU-2256	2256	–	–	–	–
90-DU-2257	2257	–	–	–	–
90-DU-2258	2258	–	–	–	–
90-DU-2259	2259	6	60	26	8
90-DU-2260	2260	1	96	2	1
90-DU-2261	2261	6	60	28	6
90-DU-2262	2262	–	–	–	–
90-DU-2263	2263	8	77	14	1
90-DU-2264	2264	4	57	32	7
90-DU-2265	2265	–	–	–	–
90-DU-2266	2266	4	68	28	2
90-DU-2267	2267	4	64	29	3
90-DU-2268	2268	7	63	29	1
90-DU-2269	2269	–	–	–	–
90-DU-2270	2270	–	–	–	–
90-DU-2271	2271	5	54	39	2
90-DU-2272	2272	5	60	34	1
90-DU-2273	2273	–	–	–	–
90-DU-2274	2274	–	–	–	–
90-DU-2275	2275	–	–	–	–
90-DU-2276	2276	3	56	40	1
90-DU-2277	2277	3	55	34	8
90-DU-2278	2278	4	65	30	1
90-DU-2279	2279	5	52	36	7
90-DU-2280	2280	3	52	35	10
90-DU-2281	2281	4	56	37	3
90-DU-2282	2282	–	–	–	–
90-DU-2283	2283	–	–	–	–
90-DU-2284	2284	–	–	–	–
90-Du-2285	2285	4	51	34	11
90-DU-2286	2286	3	63	25	9
90-DU-2287	2287	–	–	–	–
90-DU-2288	2288	2	44	36	18
90-DU-2289	2289	–	–	–	–
90-DU-2290	2290	3	60	36	1
90-DU-2291	2291	–	–	–	–
90-DU-2292	2292	4	56	27	13
90-DU-2293	2293	–	–	–	–
90-DU-2294	2294	4	63	30	3
90-DU-2295	2295	–	–	–	–
90-DU-2296	2296	4	54	29	13
90-DU-2297	2297	–	–	–	–
90-DU-2298	2298	–	–	–	–
90-DU-2299	2299	–	–	–	–
90-DU-2300	2300	–	–	–	–
90-DU-2301	2301	–	–	–	–
90-DU-2302	2302	5	67	17	11
90-DU-2303	2303	–	–	–	–
90-DU-2304	2304	–	–	–	–
90-DU-2305	2305	–	–	–	–
90-DU-2306	2306	–	–	–	–
90-DU-2307	2307	–	–	–	–
90-DU-2308	2308	–	–	–	–
90-DU-2309	2309	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2310	2310	–	–	–	–
90-DU-2311	2311	–	–	–	–
90-DU-2312	2312	3	56	35	6
90-DU-2313	2313	6	63	29	2
90-DU-2314	2314	8	61	25	6
90-DU-2315	2315	–	–	–	–
90-DU-2316	2316	7	74	18	1
90-DU-2317	2317	5	56	36	3
90-DU-2318	2318	4	62	27	7
90-DU-2319	2319	5	57	29	9
90-DU-2320	2320	–	–	–	–
90-DU-2321	2321	2	38	39	21
90-DU-2322	2322	7	75	14	4
90-DU-2323	2323	–	–	–	–
90-DU-2324	2324	–	–	–	–
90-DU-2325	2325	5	39	31	25
90-DU-2326	2326	3	40	40	17
90-DU-2327	2327	5	49	33	13
90-DU-2328	2328	–	–	–	–
90-DU-2329	2329	–	–	–	–
90-DU-2330	2330	–	–	–	–
90-DU-2331	2331	–	–	–	–
90-DU-2332	2332	7	44	48	1
90-DU-2333	2333	14	73	11	2
90-DU-2334	2334	10	76	13	1
90-DU-2335	2335	9	49	19	23
90-DU-2336	2336	–	–	–	–
90-DU-2337	2337	–	–	–	–
90-DU-2338	2338	9	59	20	12
90-DU-2339	2339	8	75	13	1
90-DU-2340	2340	10	76	13	1
90-DU-2341	2341	–	–	–	–
90-DU-2342	2342	8	75	16	1
90-DU-2343	2343	–	–	–	–
90-DU-2344	2344	5	74	17	4
90-DU-2345	2345	5	92	1	2
90-DU-2346	2346	6	84	9	1
90-DU-2347	2347	6	78	15	1
90-DU-2348	2348	7	65	27	1
90-DU-2349	2349	–	–	–	–
90-DU-2350	2350	–	–	–	–
90-DU-2351	2351	7	54	36	3
90-DU-2352	2352	7	67	25	1
90-DU-2353	2353	–	–	–	–
90-DU-2354	2354	–	–	–	–
90-DU-2355	2355	8	73	18	1
90-DU-2356	2356	6	50	42	2
90-DU-2357	2357	–	–	–	–
90-DU-2358	2358	–	–	–	–
90-DU-2359	2359	5	59	26	10
90-DU-2360	2360	–	–	–	–
90-DU-2361	2361	16	73	10	1
90-DU-2362	2362	–	–	–	–
90-DU-2363	2363	–	–	–	–
90-DU-2364	2364	10	65	17	8
90-DU-2365	2365	–	–	–	–
90-DU-2366	2366	10	74	15	1
90-DU-2367	2367	–	–	–	–
90-DU-2368	2368	6	59	23	12
90-DU-2369	2369	–	–	–	–
90-DU-2370	2370	–	–	–	–
90-DU-2371	2371	4	66	20	10
90-DU-2372	2372	–	–	–	–
90-DU-2373	2373	9	72	18	1
90-DU-2374	2374	–	–	–	–
90-DU-2375	2375	17	71	10	2
90-DU-2376	2376	–	–	–	–
90-DU-2377	2377	7	76	16	1
90-DU-2378	2378	8	65	19	8

Appendix B. (cont.)

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2379	2379	–	–	–	–
90-DU-2380	2380	4	82	13	1
90-DU-2381	2381	–	–	–	–
90-DU-2382	2382	3	58	36	3
90-DU-2383	2383	–	–	–	–
90-DU-2384	2384	10	74	15	1
90-DU-2385	2385	5	75	19	1
90-DU-2386	2386	–	–	–	–
90-DU-2387	2387	7	76	16	1
90-DU-2388	2388	–	–	–	–
90-DU-2389	2389	–	–	–	–
90-DU-2390	2390	7	69	23	1
90-DU-2391	2391	9	73	17	1
90-DU-2392	2392	7	59	24	10
90-DU-2393	2393	–	–	–	–
90-DU-2394	2394	7	72	20	1
90-DU-2395	2395	–	–	–	–
90-DU-2396	2396	6	61	26	7
90-DU-2397	2397	–	–	–	–
90-DU-2398	2398	–	–	–	–
90-DU-2399	2399	–	–	–	–
90-DU-2400	2400	4	70	19	7
90-DU-2401	2401	4	56	34	6
90-DU-2402	2402	3	57	36	4
90-DU-2403	2403	4	55	37	4
90-DU-2404	2404	–	–	–	–
90-DU-2405	2405	–	–	–	–
90-DU-2406	2406	–	–	–	–
90-DU-2407	2407	–	–	–	–
90-DU-2408	2408	–	–	–	–
90-DU-2409	2409	–	–	–	–
90-DU-2410	2410	21	77	1	1
90-DU-2411	2411	–	–	–	–
90-DU-2412	2412	5	66	27	2
90-DU-2413	2413	–	–	–	–
90-DU-2414	2414	–	–	–	–
90-DU-2415	2415	–	–	–	–
90-DU-2416	2416	–	–	–	–
90-DU-2417	2417	–	–	–	–
90-DU-2418	2418	1	5	54	40
90-DU-2419	2419	1	29	36	34
90-DU-2419	2419	7	54	26	13
90-DU-2419	2419	2	95	2	1
90-DU-2420	2420	–	–	–	–
90-DU-2421	2421	–	–	–	–
90-DU-2422	2422	3	47	34	16
90-DU-2423	2423	–	–	–	–
90-DU-2424	2424	4	51	32	13
90-DU-2425	2425	4	45	34	17
90-DU-2426	2426	5	61	28	6
90-DU-2427	2427	5	43	35	17
90-DU-2428	2428	–	–	–	–
90-DU-2429	2429	6	46	32	16
90-DU-2430	2430	3	53	34	10
90-DU-2431	2431	–	–	–	–
90-DU-2432	2432	–	–	–	–
90-DU-2433	2433	2	61	23	14
90-DU-2434	2434	3	56	31	10
90-DU-2435	2435	4	55	32	9
90-DU-2436	2436	–	–	–	–
90-DU-2437	2437	10	87	2	1
90-DU-2438	2438	6	79	13	2
90-DU-2439	2439	2	95	2	1
90-DU-2440	2440	3	53	35	9
90-DU-2441	2441	8	89	2	1
90-DU-2442	2442	–	–	–	–
90-DU-2443	2443	17	81	1	1
90-DU-2444	2444	2	96	1	1
90-DU-2445	2445	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2446	2446	–	–	–	–
90-DU-2447	2447	–	–	–	–
90-DU-2448	2448	4	58	35	3
90-DU-2449	2449	5	52	29	14
90-DU-2450	2450	5	52	30	13
90-DU-2451	2451	6	31	42	21
90-DU-2452	2452	–	–	–	–
90-DU-2453	2453	–	–	–	–
90-DU-2454	2454	1	39	40	20
90-DU-2455	2455	4	65	22	9
90-DU-2456	2456	–	–	–	–
90-DU-2457	2457	6	58	35	1
90-DU-2458	2458	6	69	23	2
90-DU-2459	2459	6	66	25	3
90-DU-2460	2460	4	58	30	8
90-DU-2461	2461	6	54	27	13
90-DU-2462	2462	7	76	15	2
90-DU-2463	2463	–	–	–	–
90-DU-2464	2464	–	–	–	–
90-DU-2465	2465	6	60	26	8
90-DU-2466	2466	–	–	–	–
90-DU-2467	2467	8	70	21	1
90-DU-2468	2468	9	70	19	2
90-DU-2469	2469	–	–	–	–
90-DU-2470	2470	–	–	–	–
90-DU-2471	2471	11	81	7	1
90-DU-2472	2472	–	–	–	–
90-DU-2473	2473	–	–	–	–
90-DU-2474	2474	10	83	6	1
90-DU-2475	2475	9	84	6	1
90-DU-2476	2476	–	–	–	–
90-DU-2477	2477	7	85	7	1
90-DU-2478	2478	6	89	4	1
90-DU-2479	2479	3	91	5	1
90-DU-2480	2480	10	84	5	1
90-DU-2481	2481	8	85	6	1
90-DU-2482	2482	18	76	5	1
90-DU-2483	2483	28	69	2	1
90-DU-2484	2484	13	79	7	1
90-DU-2485	2485	–	–	–	–
90-DU-2486	2486	8	84	7	1
90-DU-2486	2486	4	91	4	1
90-DU-2487	2487	–	–	–	–
90-DU-2488	2488	9	85	5	1
90-DU-2489	2489	–	–	–	–
90-DU-2490	2490	13	80	6	1
90-DU-2491	2491	7	85	7	1
90-DU-2492	2492	–	–	–	–
90-DU-2493	2493	6	65	26	3
90-DU-2494	2494	7	64	21	8
90-DU-2495	2495	6	62	26	6
90-DU-2496	2496	7	63	23	7
90-DU-2497	2497	–	–	–	–
90-DU-2498	2498	–	–	–	–
90-DU-2499	2499	31	53	13	3
90-DU-2500	2500	4	61	32	3
90-DU-2501	2501	5	68	22	5
90-DU-2502	2502	–	–	–	–
90-DU-2503	2503	6	71	22	1
90-DU-2504	2504	8	85	6	1
90-DU-2505	2505	7	63	28	2
90-DU-2506	2506	–	–	–	–
90-DU-2507	2507	9	73	16	1
90-DU-2508	2508	8	56	22	14
90-DU-2509	2509	–	–	–	–
90-DU-2510	2510	8	71	17	4
90-DU-2511	2511	–	–	–	–
90-DU-2512	2512	–	–	–	–
90-DU-2513	2513	5	56	27	12

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2514	2514	4	49	27	20
90-DU-2515	2515	–	–	–	–
90-DU-2516	2516	–	–	–	–
90-DU-2517	2517	13	69	15	3
90-DU-2518	2518	–	–	–	–
90-DU-2519	2519	–	–	–	–
90-DU-2520	2520	5	57	35	3
90-DU-2521	2521	–	–	–	–
90-DU-2522	2522	–	–	–	–
90-DU-2523	2523	–	–	–	–
90-DU-2524	2524	–	–	–	–
90-DU-2525	2525	–	–	–	–
90-DU-2526	2526	–	–	–	–
90-DU-2527	2527	–	–	–	–
90-DU-2528	2528	10	74	14	2
90-DU-2529	2529	1	93	5	1
90-DU-2530	2530	7	58	33	2
90-DU-2531	2531	4	59	35	2
90-DU-2532	2532	–	–	–	–
90-DU-2533	2533	–	–	–	–
90-DU-2534	2534	9	77	13	1
90-DU-2535	2535	–	–	–	–
90-DU-2536	2536	7	57	35	1
90-DU-2537	2537	–	–	–	–
90-DU-2538	2538	7	58	31	4
90-DU-2539	2539	9	62	27	2
90-DU-2540	2540	6	53	32	9
90-DU-2541	2541	6	58	29	7
90-DU-2542	2542	5	57	35	3
90-DU-2543	2543	8	61	24	7
90-DU-2544	2544	8	50	34	8
90-DU-2545	2545	7	57	30	6
90-DU-2546	2546	9	56	33	2
90-DU-2547	2547	–	–	–	–
90-DU-2548	2548	7	55	31	7
90-DU-2549	2549	–	–	–	–
90-DU-2550	2550	–	–	–	–
90-DU-2551	2551	4	51	37	8
90-DU-2552	2552	6	70	23	1
90-DU-2553	2553	8	77	14	1
90-DU-2554	2554	8	65	23	4
90-DU-2555	2555	10	73	16	1
90-DU-2556	2556	–	–	–	–
90-DU-2557	2557	–	–	–	–
90-DU-2558	2558	–	–	–	–
90-DU-2559	2559	7	58	34	1
90-DU-2560	2560	–	–	–	–
90-DU-2561	2561	8	66	25	1
90-DU-2562	2562	8	64	24	4
90-DU-2563	2563	–	–	–	–
90-DU-2564	2564	6	60	28	6
90-DU-2565	2565	–	–	–	–
90-DU-2566	2566	–	–	–	–
90-DU-2567	2567	5	58	35	2
90-DU-2568	2568	6	70	23	1
90-DU-2569	2569	–	–	–	–
90-DU-2570	2570	–	–	–	–
90-DU-2571	2571	8	65	26	1
90-DU-2572	2572	–	–	–	–
90-DU-2573	2573	8	72	19	1
90-DU-2574	2574	–	–	–	–
90-DU-2575	2575	–	–	–	–
90-DU-2576	2576	6	56	37	1
90-DU-2577	2577	5	61	33	1
90-DU-2578	2578	7	70	22	1
90-DU-2579	2579	–	–	–	–
90-DU-2580	2580	6	66	27	1
90-DU-2581	2581	6	66	27	1
90-DU-2582	2582	12	78	9	1

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
90-DU-2583	2583	5	74	20	1
90-DU-2584	2584	–	–	–	–
90-DU-2585	2585	7	64	28	1
90-DU-2586	2586	–	–	–	–
90-DU-2587	2587	9	62	25	4
90-DU-2588	2588	10	63	20	7
90-DU-2589	2589	–	–	–	–
90-DU-2590	2590	6	60	32	2
90-DU-2591	2591	5	54	38	3
90-DU-2592	2592	7	64	25	4
90-DU-2593	2593	9	85	5	1
90-DU-2594	2594	–	–	–	–
90-DU-2595	2595	4	54	35	7
90-DU-2596	2596	7	68	18	7
90-DU-2597	2597	13	81	4	2
90-DU-2598	2598	5	59	27	9
90-DU-2599	2599	–	–	–	–
90-DU-2600	2600	6	59	24	11
90-DU-2601	2601	6	74	19	1
90-DU-2602	2602	4	64	28	4
90-DU-2603	2603	–	–	–	–
90-DU-2604	2604	–	–	–	–
90-DU-2605	2605	–	–	–	–
90-DU-2606	2606	5	54	30	11
90-DU-2607	2607	6	60	25	9
90-DU-2608	2608	4	68	26	2
90-DU-2609	2609	–	–	–	–
90-DU-2610	2610	9	77	13	1
90-DU-2611	2611	6	56	37	1
90-DU-2611	2611	13	85	1	1
90-DU-2612	2612	–	–	–	–
90-DU-2613	2613	–	–	–	–
90-DU-2614	2614	–	–	–	–
90-DU-2615	2615	6	44	34	16
90-DU-2616	2616	1	14	51	34
90-DU-2617	2617	–	–	–	–
91-DU-3000	3000	–	–	–	–
91-DU-3001	3001	7	62	24	7
91-DU-3002	3002	11	64	18	7
91-DU-3003	3003	16	65	18	1
91-DU-3004	3004	9	57	26	8
91-DU-3005	3005	36	34	23	7
91-DU-3006	3006	43	49	6	2
91-DU-3007	3007	1	58	30	11
91-DU-3008	3008	11	66	18	5
91-DU-3009	3009	–	–	–	–
91-DU-3010	3010	10	64	22	4
91-DU-3011	3011	11	61	21	7
91-DU-3012	3012	–	–	–	–
91-DU-3013	3013	8	60	30	2
91-DU-3014	3014	–	–	–	–
91-DU-3015	3015	5	65	25	5
91-DU-3016	3016	–	–	–	–
91-DU-3017	3017	9	61	23	7
91-DU-3018	3018	10	58	22	10
91-DU-3019	3019	9	56	19	16
91-DU-3020	3020	30	48	18	4
91-DU-3021	3021	11	67	21	1
91-DU-3022	3022	6	42	42	10
91-DU-3023	3023	7	57	28	8
91-DU-3024	3024	5	61	28	6
91-DU-3025	3025	8	6	23	8
91-DU-3026	3026	–	–	–	–
91-DU-3027	3027	–	–	–	–
91-DU-3028	3028	20	77	2	1
91-DU-3029	3029	5	58	27	10
91-DU-3030	3030	8	53	27	12
91-DU-3031	3031	–	–	–	–
91-DU-3032	3032	–	–	–	–

Appendix B. (cont.)

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3033	3033	–	–	–	–
91-DU-3034	3034	–	–	–	–
91-DU-3035	3035	8	51	32	9
91-DU-3036	3036	–	–	–	–
91-DU-3037	3037	–	–	–	–
91-DU-3038	3038	–	–	–	–
91-DU-3039	3039	5	54	30	11
91-DU-3040	3040	–	–	–	–
91-DU-3041	3041	–	–	–	–
91-DU-3042	3042	–	–	–	–
91-DU-3043	3043	10	64	21	5
91-DU-3044	3044	7	62	20	11
91-DU-3045	3045	10	55	25	10
91-DU-3046	3046	6.03	66	20	8
91-DU-3047	3047	–	–	–	–
91-DU-3048	3048	–	–	–	–
91-DU-3049	3049	3	55	28	14
91-DU-3050	3050	–	–	–	–
91-DU-3051	3051	8	58	30	4
91-DU-3052	3052	–	–	–	–
91-DU-3053	3053	–	–	–	–
91-DU-3054	3054	21	68	9	2
91-DU-3055	3055	7	56	27	10
91-DU-3056	3056	4	55	34	7
91-DU-3057	3057	7	58	24	11
91-DU-3058	3058	6	58	23	13
91-DU-3059	3059	–	–	–	–
91-DU-3060	3060	–	–	–	–
91-DU-3061	3061	–	–	–	–
91-DU-3062	3062	–	–	–	–
91-DU-3063	3063	13	53	22	12
91-DU-3064	3064	9	66	18	7
91-DU-3065	3065	9	60	23	8
91-DU-3066	3066	–	–	–	–
91-DU-3067	3067	8	54	26	12
91-DU-3068	3068	6	52	25	17
91-DU-3069	3069	–	–	–	–
91-DU-3070	3070	–	–	–	–
91-DU-3071	3071	–	–	–	–
91-DU-3072	3072	–	–	–	–
91-DU-3073	3073	–	–	–	–
91-DU-3074	3074	–	–	–	–
91-DU-3075	3075	–	–	–	–
91-DU-3076	3076	–	–	–	–
91-DU-3077	3077	–	–	–	–
91-DU-3078	3078	9	55	21	15
91-DU-3079	3079	–	–	–	–
91-DU-3080	3080	5	51	31	13
91-DU-3081	3081	–	–	–	–
91-DU-3082	3082	10	55	23	12
91-DU-3083	3083	–	–	–	–
91-DU-3084	3084	–	–	–	–
91-DU-3085	3085	–	–	–	–
91-DU-3086	3086	13	59	20	8
91-DU-3087	3087	–	–	–	–
91-DU-3088	3088	–	–	–	–
91-DU-3089	3089	9	60	22	9
91-DU-3090	3090	3	61	26	10
91-DU-3091	3091	–	–	–	–
91-DU-3092	3092	–	–	–	–
91-DU-3093	3093	6	58	26	10
91-DU-3094	3094	–	–	–	–
91-DU-3095	3095	9	64	23	4
91-DU-3096	3096	7	62	20	11
91-DU-3097	3097	12	54	22	12
91-DU-3098	3098	–	–	–	–
91-DU-3099	3099	–	–	–	–
91-DU-3100	3100	–	–	–	–
91-DU-3101	3101	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3102	3102	10	57	23	10
91-DU-3103	3103	7	75	16	2
91-DU-3104	3104	7	67	22	4
91-DU-3105	3105	–	–	–	–
91-DU-3106	3106	–	–	–	–
91-DU-3107	3107	–	–	–	–
91-DU-3108	3108	–	–	–	–
91-DU-3109	3109	13	75	10	2
91-DU-3110	3110	–	–	–	–
91-DU-3111	3111	–	–	–	–
91-DU-3112	3112	–	–	–	–
91-DU-3113	3113	–	–	–	–
91-DU-3114	3114	12	75	13	0
91-DU-3115	3115	11	78	11	0
91-DU-3116	3116	–	–	–	–
91-DU-3117	3117	10	69	17	4
91-DU-3118	3118	–	–	–	–
91-DU-3119	3119	–	–	–	–
91-DU-3120	3220	–	–	–	–
91-DU-3121	3221	–	–	–	–
91-DU-3122	3122	–	–	–	–
91-DU-3123	3123	5	74	19	2
91-DU-3124	3124	–	–	–	–
91-DU-3125	3125	–	–	–	–
91-DU-3126	3126	–	–	–	–
91-DU-3127	3127	–	–	–	–
91-DU-3128	3128	–	–	–	–
91-DU-3129	3129	–	–	–	–
91-DU-3130	3130	1	94	5	0
91-DU-3131	3131	9	61	27	3
91-DU-3132	3132	–	–	–	–
91-DU-3133	3133	4	59	34	3
91-DU-3134	3134	–	–	–	–
91-DU-3135	3135	–	–	–	–
91-DU-3136	3136	19	65	16	0
91-DU-3137	3137	–	–	–	–
91-DU-3138	3138	5	62	33	0
91-DU-3139	3139	–	–	–	–
91-DU-3140	3140	–	–	–	–
91-DU-3141	3141	8	73	18	1
91-DU-3142	3142	8	65	26	0
91-DU-3143	3143	–	–	–	–
91-DU-3144	3144	–	–	–	–
91-DU-3145	3145	6	64	27	3
91-DU-3146	3146	9	67	16	8
91-DU-3147	3147	7	66	17	10
91-DU-3148	3148	–	–	–	–
91-DU-3149	3149	14	62	18	6
91-DU-3150	3150	–	–	–	–
91-DU-3151	3151	–	–	–	–
91-DU-3152	3152	7	65	19	9
91-DU-3153	3153	–	–	–	–
91-DU-3154	3154	–	–	–	–
91-DU-3155	3155	8	71	18	3
91-DU-3156	3156	–	–	–	–
91-DU-3157	3157	7	57	30	6
91-DU-3158	3158	9	59	23	9
91-DU-3159	3159	8	62	22	8
91-DU-3160	3160	–	–	–	–
91-DU-3161	3161	10	58	25	7
91-DU-3162	3162	–	–	–	–
91-DU-3163	3163	10	57	23	10
91-DU-3164	3164	–	–	–	–
91-DU-3165	3165	12	65	19	4
91-DU-3166	3166	–	–	–	–
91-DU-3167	3167	8	56	25	11
91-DU-3168	3168	–	–	–	–
91-DU-3169	3169	–	–	–	–
91-DU-3170	3170	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3171	3171	–	–	–	–
91-DU-3172	3172	3	58	34	5
91-DU-3173	3173	12	65	18	5
91-DU-3174	3174	–	–	–	–
91-DU-3175	3175	–	–	–	–
91-DU-3176	3176	9	53	26	12
91-DU-3177	3177	–	–	–	–
91-DU-3178	3178	–	–	–	–
91-DU-3179	3179	–	–	–	–
91-DU-3180	3180	15	80	3	2
91-DU-3181	3181	10	58	25	7
91-DU-3182	3182	–	–	–	–
91-DU-3183	3183	–	–	–	–
91-DU-3184	3184	7	66	24	3
91-DU-3185	3185	–	–	–	–
91-DU-3186	3186	4	58	31	7
91-DU-3187	3187	–	–	–	–
91-DU-3188	3188	6	56	33	5
91-DU-3189	3189	–	–	–	–
91-DU-3190	3190	–	–	–	–
91-DU-3191	3191	–	–	–	–
91-DU-3192	3192	4	62	29	5
91-DU-3193	3193	7	58	31	4
91-DU-3194	3194	–	–	–	–
91-DU-3195	3195	–	–	–	–
91-DU-3196	3196	–	–	–	–
91-DU-3197	3197	11	54	34	1
91-DU-3198	3198	–	–	–	–
91-DU-3199	3199	–	–	–	–
91-DU-3200	3200	7	55	34	4
91-DU-3201	3201	–	–	–	–
91-DU-3202	3202	9	51	37	3
91-DU-3203	3203	8	57	26	9
91-DU-3204	3204	–	–	–	–
91-DU-3205	3205	9	51	35	5
91-DU-3206	3206	6	56	29	9
91-DU-3207	3207	11	57	22	10
91-DU-3208	3208	5	73	18	4
91-DU-3209	3209	–	–	–	–
91-DU-3210	3210	11	82	6	1
91-DU-3211	3211	–	–	–	–
91-DU-3213	3213	8	66	17	9
91-DU-3214	3214	8	59	25	8
91-DU-3215	3215	–	–	–	–
91-DU-3216	3216	12	67	16	5
91-DU-3217	3217	–	–	–	–
91-DU-3218	3218	–	–	–	–
91-DU-3219	3219	–	–	–	–
91-DU-3220	3220	–	–	–	–
91-DU-3221	3221	6	75	17	2
91-DU-3222	3222	7	65	19	9
91-DU-3223	3223	–	–	–	–
91-DU-3224	3224	–	–	–	–
91-DU-3225	3225	–	–	–	–
91-DU-3226	3226	9	63	20	8
91-DU-3227	3227	6	64	23	8
91-DU-3228	3228	6	62	30	2
91-DU-3229	3229	–	–	–	–
91-DU-3230	3230	–	–	–	–
91-DU-3231	3231	5	60	33	2
91-DU-3232	3232	–	–	–	–
91-DU-3233	3233	24	70	6	0
91-DU-3234	3234	–	–	–	–
91-DU-3235	3235	7	63	29	1
91-DU-3236	3236	–	–	–	–
91-DU-3237	3237	–	–	–	–
91-DU-3238	3238	7	65	22	6
91-DU-3239	3239	4	54	39	3
91-DU-3240	3240	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3241	3241	7	59	30	4
91-DU-3242	3242	–	–	–	–
91-DU-3243	3243	4	60	31	5
91-DU-3244	3244	–	–	–	–
91-DU-3245	3245	–	–	–	–
91-DU-3246	3246	–	–	–	–
91-DU-3247	3247	7	66	20	7
91-DU-3248	3248	7	68	20	5
91-DU-3249	3249	–	–	–	–
91-DU-3250	3250	7	61	28	4
91-DU-3251	3251	10	61	27	2
91-DU-3252	3252	8	63	25	4
91-DU-3253	3253	11	61	21	7
91-DU-3254	3254	–	–	–	–
91-DU-3255	3255	9	61	21	9
91-DU-3256	3256	–	–	–	–
91-DU-3257	3257	6	67	24	3
91-DU-3258	3258	–	–	–	–
91-DU-3259	3259	–	–	–	–
91-DU-3260	3260	8	65	24	3
91-DU-3261	3261	–	–	–	–
91-DU-3262	3262	15	79	5	1
91-DU-3263	3263	–	–	–	–
91-DU-3264	3264	10	69	20	1
91-DU-3265	3265	–	–	–	–
91-DU-3266	3266	–	–	–	–
91-DU-3267	3267	6	64	29	1
91-DU-3268	3268	–	–	–	–
91-DU-3269	3269	21	76	2	1
91-DU-3270	3270	–	–	–	–
91-DU-3271	3271	–	–	–	–
91-DU-3272	3272	10	58	31	1
91-DU-3273	3273	–	–	–	–
91-DU-3274	3274	10	61	23	6
91-DU-3275	3275	–	–	–	–
91-DU-3276	3276	10	57	23	10
91-DU-3277	3277	9	60	20	11
91-DU-3278	3278	1	15	59	25
91-DU-3279	3279	10	58	22	10
91-DU-3279	3280	–	–	–	–
91-DU-3281	3281	7	57	25	11
91-DU-3282	3282	10	66	20	4
91-DU-3283	3283	11	64	20	5
91-DU-3284	3284	7	50	30	13
91-DU-3285	3285	5	45	36	14
91-DU-3286	3286	–	–	–	–
91-DU-3287	3287	–	–	–	–
91-DU-3288	3288	5	78	15	2
91-DU-3289	3289	–	–	–	–
91-DU-3290	3290	15	76	8	1
91-DU-3291	3291	–	–	–	–
91-DU-3292	3292	–	–	–	–
91-DU-3293	3293	9	60	24	7
91-DU-3294	3294	–	–	–	–
91-DU-3295	3295	8	61	22	9
91-DU-3296	3296	–	–	–	–
91-DU-3297	3297	13	60	20	7
91-DU-3298	3298	–	–	–	–
91-DU-3299	3299	–	–	–	–
91-DU-3300	3300	10	58	23	9
91-DU-3301	3301	2	65	31	2
91-DU-3302	3302	9	61	22	8
91-DU-3303	3303	–	–	–	–
91-DU-3304	3304	9	65	25	1
91-DU-3305	3305	–	–	–	–
91-DU-3306	3306	–	–	–	–
91-DU-3307	3307	5	56	31	8
91-DU-3308	3308	–	–	–	–
91-DU-3309	3309	7	68	19	6

Appendix B. (cont.)

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3310	3310	–	–	–	–
91-DU-3311	3311	–	–	–	–
91-DU-3312	3312	10	60	28	2
91-DU-3313	3313	–	–	–	–
91-DU-3314	3314	–	–	–	–
91-DU-3315	3315	10	64	20	6
91-DU-3316	3316	–	–	–	–
91-DU-3317	3317	9	77	13	1
91-DU-3318	3318	–	–	–	–
91-DU-3319	3319	–	–	–	–
91-DU-3320	3320	7	58	27	8
91-DU-3321	3321	6	60	29	5
91-DU-3322	3322	–	–	–	–
91-DU-3323	3323	8	58	28	6
91-DU-3324	3324	6	62	27	4
91-DU-3325	3325	–	–	–	–
91-DU-3326	3326	–	–	–	–
91-DU-3327	3327	8	66	21	5
91-DU-3328	3328	–	–	–	–
91-DU-3329	3329	–	–	–	–
91-DU-3330	3330	11	62	23	4
91-DU-3331	3331	12	73	11	4
91-DU-3332	3332	–	–	–	–
91-DU-3333	3333	–	–	–	–
91-DU-3334	3334	4	55	30	11
91-DU-3335	3335	6	57	27	10
91-DU-3336	3336	–	–	–	–
91-DU-3337	3337	6	52	35	7
91-DU-3338	3338	11	60	21	8
91-DU-3339	3339	–	–	–	–
91-DU-3340	3340	–	–	–	–
91-DU-3341	3341	6	53	28	13
91-DU-3342	3342	9	53	30	8
91-DU-3343	3343	–	–	–	–
91-DU-3344	3344	24	65	8	2
91-DU-3345	3345	7	44	32	17
91-DU-3346	3346	5	42	33	20
91-DU-3347	3347	–	–	–	–
91-DU-3348	3348	–	–	–	–
91-DU-3349	3349	21	68	8	3
91-DU-3350	3350	14	70	12	4
91-DU-3351	3351	–	–	–	–
91-DU-3352	3352	2	74	20	4
91-DU-3353	3353	–	–	–	–
91-DU-3354	3354	–	–	–	–
91-DU-3355	3355	9	48	33	10
91-DU-3356	3356	7	50	37	6
91-DU-3357	3357	6	55	30	9
91-DU-3358	3358	–	–	–	–
91-DU-3359	3359	1	40	55	4
91-DU-3360	3360	–	–	–	–
91-DU-3361	3361	–	–	–	–
91-DU-3362	3362	10	60	21	9
91-DU-3363	3363	–	–	–	–
91-DU-3364	3364	10	74	10	6
91-DU-3365	3365	9	61	21	9
91-DU-3366	3366	11	70	18	1
91-DU-3367	3367	–	–	–	–
91-DU-3368	3368	–	–	–	–
91-DU-3369	3369	–	–	–	–
91-DU-3370	3370	–	–	–	–
91-DU-3371	3371	–	–	–	–
91-DU-3372	3372	–	–	–	–
91-DU-3373	3373	13	58	23	6
91-DU-3374	3374	–	–	–	–
91-DU-3375	3375	17	78	4	1
91-DU-3376	3376	11	62	21	6
91-DU-3377	3377	–	–	–	–
91-DU-3378	3378	–	–	–	–

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3379	3379	11	68	19	2
91-DU-3380	3380	–	–	–	–
91-DU-3381	3381	–	–	–	–
91-DU-3382	3382	15	63	17	5
91-DU-3383	3383	11	60	24	5
91-DU-3384	3384	4	70	22	4
91-DU-3385	3385	3	40	26	31
91-DU-3386	3386	–	–	–	–
91-DU-3387	3387	5	63	24	8
91-DU-3388	3388	–	–	–	–
91-DU-3389	3389	7	50	37	6
91-DU-3390	3390	–	–	–	–
91-DU-3391	3391	–	–	–	–
91-DU-3392	3392	4	66	28	2
91-DU-3393	3393	–	–	–	–
91-DU-3394	3394	9	81	6	4
91-DU-3395	3395	–	–	–	–
91-DU-3396	3396	0	94	5	1
91-DU-3397	3397	–	–	–	–
91-DU-3398	3398	7	65	20	8
91-DU-3399	3399	–	–	–	–
91-DU-3400	3400	–	–	–	–
91-DU-3401	3401	–	–	–	–
91-DU-3402	3402	8	59	22	11
91-DU-3403	3403	8	55	24	13
91-DU-3404	3404	6	58	25	11
91-DU-3405	3405	–	–	–	–
91-DU-3406	3406	–	–	–	–
91-DU-3407	3407	6	57	27	11
91-DU-3408	3408	7	56	28	9
91-DU-3409	3409	8	58	22	12
91-DU-3410	3410	7	50	30	13
91-DU-3411	3411	13	54	26	7
91-DU-3412	3412	–	–	–	–
91-DU-3413	3413	5	57	23	15
91-DU-3414	3414	–	–	–	–
91-DU-3415	3415	14	80	5	1
91-DU-3416	3416	–	–	–	–
91-DU-3417	3417	14	50	31	5
91-DU-3418	3418	9	55	27	9
91-DU-3419	3419	–	–	–	–
91-DU-3420	3420	39	59	1	1
91-DU-3421	3421	–	–	–	–
91-DU-3422	3422	–	–	–	–
91-DU-3423	3423	12	62	23	3
91-DU-3424	3424	–	–	–	–
91-DU-3425	3425	9	62	26	3
91-DU-3426	3426	–	–	–	–
91-DU-3427	3427	6	62	30	2
91-DU-3428	3428	–	–	–	–
91-DU-3429	3429	–	–	–	–
91-DU-3430	3430	7	72	10	11
91-DU-3431	3431	9	65	24	2
91-DU-3432	3432	14	74	8	4
91-DU-3433	3433	6	73	20	1
91-DU-3434	3434	–	–	–	–
91-DU-3435	3435	9	79	11	1
91-DU-3436	3436	7	67	21	5
91-DU-3437	3437	9	56	34	1
91-DU-3438	3438	13	74	10	3
91-DU-3439	3439	6	63	26	5
91-DU-3440	3440	12	70	16	2
91-DU-3441	3441	7	66	20	7
91-DU-3442	3442	–	–	–	–
91-DU-3443	3443	9	75	14	2
91-DU-3444	3444	–	–	–	–
91-DU-3445	3445	13	65	18	4
91-DU-3446	3446	32	60	7	1
91-DU-3447	3447	4	66	22	8

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3448	3448	5	85	8	2
91-DU-3449	3449	8	74	14	4
91-DU-3450	3450	11	56	24	9
91-DU-3451	3451	17	52	26	5
91-DU-3452	3452	18	64	13	5
91-DU-3453	3453	15	58	22	5
91-DU-3454	3454	5	67	20	8
91-DU-3455	3455	8	58	26	8
91-DU-3456	3456	6	62	25	7
91-DU-3457	3457	17	68	13	2
91-DU-3458	3458	11	75	11	3
91-DU-3459	3459	12	67	17	4
91-DU-3460	3460	15	66	17	2
91-DU-3461	3461	–	–	–	–
91-DU-3462	3462	1	11	55	33
91-DU-3462	3463	0	10	70	20
91-DU-3464	3464	3	36	52	9
91-DU-3465	3465	7	43	38	12
91-DU-3466	3466	1	21	61	17

Sample	Station	Texture (%)			
		Granules	Sand	Silt	Clay
91-DU-3467	3467	–	–	–	–
91-DU-3468	3468	–	–	–	–
91-DU-3469	3469	–	–	–	–
91-DU-3470	3470	–	–	–	–
91-DU-3471	3471	–	–	–	–
91-DU-3472	3472	–	–	–	–
91-DU-3473	3473	9	74	14	3
91-DU-3474	3474	–	–	–	–
91-DU-3475	3475	–	–	–	–
91-DU-3476	3476	4	89	6	1
91-DU-3477	3477	21	75	3	1
91-DU-3478	3478	12	64	18	6
91-DU-3479	3479	0	15	63	22
91DU-3480	3480	–	–	–	–
91DU-3481	3481	–	–	–	–
91DU-3482	3482	–	–	–	–
91DU-3483	3483	–	–	–	–
91DU-3484	3484	–	–	–	–

Appendix C

Lithology of samples.

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
90-DU-2001	2001	14.2	72	24	0	4
90-DU-2003	2003	1.7	99	0	0	1
90-DU-2006	2006	0.0	100	0	0	0
90-DU-2007	2007	0.0	100	0	0	0
90-DU-2008	2008	1.7	96	0	0	4
90-DU-2009	2009	19.2	66	28	2	4
90-DU-2010	2010	0.0	94	0	0	6
90-DU-2011	2011	0.8	98	0	0	2
90-DU-2012	2012	4.2	94	0	2	4
90-DU-2013	2013	0.0	100	0	0	0
90-DU-2018	2018	45.0	68	30	0	2
90-DU-2019	2019	32.5	60	40	0	0
90-DU-2020	2020	28.3	86	12	0	2
90-DU-2023	2023	47.5	44	56	0	0
90-DU-2024	2024	–	82	18	0	0
90-DU-2025	2025	–	92	8	0	0
90-DU-2028	2028	45.8	45	55	0	0
90-DU-2029	2029	10.8	54	46	0	0
90-DU-2031	2031	–	66	32	0	2
90-DU-2032	2032	10.0	86	14	0	0
90-DU-2033	2033	0.8	–	–	–	–
90-DU-2036	2036	0.0	98	0	0	2
90-DU-2037	2037	–	100	0	0	0
90-DU-2039	2039	32.5	64	36	0	0
90-DU-2041	2041	0.0	100	0	0	0
90-DU-2042	2042	5.0	96	0	2	2
90-DU-2043	2043	0.8	98	0	0	2
90-DU-2044	2044	0.8	100	0	0	0
90-DU-2045	2045	0.0	98	0	0	2
90-DU-2046	2046	1.7	98	0	2	0
90-DU-2047	2047	0.8	96	0	4	0
90-DU-2048	2048	0.0	96	0	0	4
90-DU-2050	2050	0.8	100	0	0	0
90-DU-2051	2051	0.0	100	0	0	0
90-DU-2052	2052	0.0	100	0	0	0
90-DU-2053	2053	0.8	96	0	0	4
90-DU-2054	2054	2.5	96	0	2	2
90-DU-2055	2055	5.0	98	0	0	2
90-DU-2056	2056	2.5	98	0	0	2
90-DU-2057	2057	16.7	90	10	0	0
90-DU-2058	2058	42.5	80	16	0	4
90-DU-2061	2061	17.5	100	0	0	0
90-DU-2063	2063	14.2	92	8	0	0
90-DU-2064	2064	0.0	100	0	0	0
90-DU-2066	2066	0.0	96	0	0	4
90-DU-2067	2067	1.7	100	0	0	0
90-DU-2068	2068	0.0	100	0	0	0
90-DU-2069	2069	–	96	0	0	4
90-DU-2070	2070	50.0	50	50	0	0
90-DU-2072	2072	–	98	0	0	2
90-DU-2073	2073	6.7	98	0	0	2
90-DU-2074	2074	0.8	100	0	0	0
90-DU-2075	2075	4.2	98	0	0	2
90-DU-2076	2076	0.8	100	0	0	0
90-DU-2078	2078	–	100	0	0	0
90-DU-2080	2080	0.8	100	0	0	0
90-DU-2081	2081	0.0	100	0	0	0
90-DU-2085	2085	–	100	0	0	0
90-DU-2086	2086	0.8	100	0	0	0
90-DU-2087	2087	0.8	100	0	0	0
90-DU-2088	2088	–	96	0	0	4
90-DU-2089	2089	50.8	48	46	0	6
90-DU-2090	2090	–	72	28	0	0
90-DU-2092	2092	0.0	94	2	0	4
90-DU-2094	2094	8.3	96	4	0	0
90-DU-2099	2099	0.8	98	0	2	0
90-DU-2100	2100	0.0	100	0	0	0
90-DU-2102	2102	5.0	100	0	0	0
90-DU-2105	2105	0.8	100	0	0	0
90-DU-2106	2106	0.0	100	0	0	0
90-DU-2107	2107	0.0	100	0	0	0
90-DU-2108	2108	0.8	100	0	0	0
90-DU-2110	2110	0.0	100	0	0	0
90-DU-2111	2111	–	98	2	0	0
90-DU-2114	2114	0.0	100	0	0	0
90-DU-2115	2115	0.0	100	0	0	0
90-DU-2116	2116	55.6	84	16	0	0
90-DU-2118	2118	0.8	100	0	0	0
90-DU-2119	2119	0.0	100	0	0	0
90-DU-2123	2123	0.0	100	0	0	0
90-DU-2125	2125	8.3	100	0	0	0
90-DU-2126	2126	7.5	98	0	0	2
90-DU-2128	2128	0.8	98	0	0	2
90-DU-2131	2131	0.0	100	0	0	0
90-DU-2132	2132	0.0	100	0	0	0
90-DU-2135	2135	0.0	100	0	0	0
90-DU-2140	2140	0.0	100	0	0	0
90-DU-2141	2141	0.8	100	0	0	0
90-DU-2142	2142	0.0	100	0	0	0
90-DU-2145	2145	–	60	30	0	10
90-DU-2146	2146	0.0	100	0	0	0
90-DU-2148	2148	0.8	100	0	0	0
90-DU-2149	2149	6.7	100	0	0	0
90-DU-2155	2155	75.8	30	70	0	0
90-DU-2156	2156	65.8	70	0	0	30
90-DU-2159	2159	0.8	96	4	0	0
90-DU-2163	2163	–	98	0	0	2
90-DU-2164	2164	–	60	6	0	34
90-DU-2168	2168	–	100	0	0	0
90-DU-2169	2169	–	100	0	0	0
90-DU-2170	2170	0.0	100	0	0	0
90-DU-2172	2172	0.8	100	0	0	0
90-DU-2173	2173	0.0	100	0	0	0
90-DU-2175	2175	5.0	100	0	0	0
90-DU-2176	2176	5.0	100	0	0	0
90-DU-2177	2177	0.8	100	0	0	0
90-DU-2178	2178	1.7	94	0	2	4
90-DU-2179	2179	5.0	98	0	0	2
90-DU-2181	2181	0.0	98	0	0	2
90-DU-2183	2183	0.0	98	0	0	2
90-DU-2184	2184	0.0	96	0	0	4
90-DU-2185	2185	0.0	100	0	0	0
90-DU-2186	2186	0.0	100	0	0	0
90-DU-2188	2188	0.0	100	0	0	0
90-DU-2190	2190	0.0	100	0	0	0
90-DU-2191	2191	0.0	100	0	0	0
90-DU-2192	2192	–	98	0	0	2
90-DU-2195	2195	10.0	90	0	10	0
90-DU-2196	2196	0.0	98	0	0	2
90-DU-2197	2197	9.2	96	0	4	0
90-DU-2198	2198	3.3	94	0	2	4
90-DU-2199	2199	0.8	100	0	0	0
90-DU-2200	2200	0.8	82	0	4	14
90-DU-2201	2201	1.7	84	0	0	16
90-DU-2202	2202	4.2	100	0	0	0
90-DU-2203	2203	5.8	100	0	0	0
90-DU-2204	2204	3.3	96	0	4	0
90-DU-2205	2205	0.0	–	–	–	–

– No data available

Appendix C. (cont.)

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
90-DU-2206	2206	12.5	100	0	0	0
90-DU-2207	2207	10.0	100	0	0	0
90-DU-2209	2209	7.5	96	0	2	2
90-DU-2210	2210	0.8	98	0	0	2
90-DU-2211	2211	0.8	98	0	0	2
90-DU-2213	2213	0.8	88	0	0	12
90-DU-2214	2214	–	100	0	0	0
90-DU-2217	2217	0.0	100	0	0	0
90-DU-2218	2218	2.5	94	0	6	0
90-DU-2219	2219	1.7	96	0	0	4
90-DU-2220	2220	5.8	98	0	2	0
90-DU-2221	2221	0.8	100	0	0	0
90-DU-2223	2223	11.7	96	0	2	2
90-DU-2225	2225	0.8	–	–	–	–
90-DU-2226	2226	1.7	100	0	0	0
90-DU-2227	2227	6.7	100	0	0	0
90-DU-2229	2229	10.0	96	0	2	2
90-DU-2230	2230	12.5	92	0	6	2
90-DU-2231	2231	9.2	90	0	10	0
90-DU-2233	2233	0.8	100	0	0	0
90-DU-2235	2235	0.0	100	0	0	0
90-DU-2237	2237	0.0	100	0	0	0
90-DU-2238	2238	–	100	0	0	0
90-DU-2240	2240	7.5	92	0	4	4
90-DU-2241	2241	2.5	100	0	0	0
90-DU-2244	2244	0.8	100	0	0	0
90-DU-2245	2245	2.5	98	0	0	2
90-DU-2248	2248	0.0	98	0	0	2
90-DU-2250	2250	0.8	96	0	0	4
90-DU-2251	2251	–	100	0	0	0
90-DU-2252	2252	20.8	86	0	14	0
90-DU-2254	2254	11.7	98	0	0	2
90-DU-2259	2259	15.0	94	0	6	0
90-DU-2260	2260	–	100	0	0	0
90-DU-2261	2261	0.8	98	0	0	2
90-DU-2262	2262	–	–	–	–	–
90-DU-2263	2263	–	98	0	0	2
90-DU-2264	2264	0.8	100	0	0	0
90-DU-2266	2266	0.0	100	0	0	0
90-DU-2267	2267	–	92	0	0	8
90-DU-2269	2269	0.0	–	–	–	–
90-DU-2271	2271	0.8	100	0	0	0
90-DU-2272	2272	0.0	100	0	0	0
90-DU-2276	2276	0.0	98	0	0	2
90-DU-2277	2277	0.8	98	0	0	2
90-DU-2278	2278	0.0	100	0	0	0
90-DU-2279	2279	0.0	100	0	0	0
90-DU-2280	2280	0.0	100	0	0	0
90-DU-2281	2281	0.0	96	0	0	4
90-DU-2285	2285	25.8	76	24	0	0
90-DU-2286	2286	1.7	100	0	0	0
90-DU-2287	2287	–	–	–	–	–
90-DU-2288	2288	35.8	82	18	0	0
90-DU-2290	2290	0.0	88	0	0	12
90-DU-2292	2292	0.0	94	0	0	6
90-DU-2294	2294	0.0	98	0	0	2
90-DU-2296	2296	0.0	100	0	0	0
90-DU-2302	2302	0.8	100	0	0	0
90-DU-2304	2304	–	100	0	0	0
90-DU-2312	2312	0.0	98	0	2	0
90-DU-2313	2313	0.8	100	0	0	0
90-DU-2314	2314	0.0	100	0	0	0
90-DU-2316	2316	0.8	98	0	0	2
90-DU-2317	2317	0.0	100	0	0	0
90-DU-2318	2318	22.5	62	38	0	0
90-DU-2319	2319	17.5	88	12	0	0
90-DU-2321	2321	27.5	72	28	0	0
90-DU-2322	2322	31.7	82	18	0	0
90-DU-2323	2323	–	80	20	0	0

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
90-DU-2325	2325	48.3	82	18	0	0
90-DU-2326	2326	32.5	78	22	0	0
90-DU-2327	2327	43.3	70	28	0	2
90-DU-2332	2332	0.0	100	0	0	0
90-DU-2333	2333	0.0	100	0	0	0
90-DU-2334	2334	0.8	96	0	0	4
90-DU-2335	2335	0.8	100	0	0	0
90-DU-2338	2338	0.8	100	0	0	0
90-DU-2339	2339	0.8	100	0	0	0
90-DU-2340	2340	0.8	100	0	0	0
90-DU-2342	2342	0.8	100	0	0	0
90-DU-2344	2344	0.0	100	0	0	0
90-DU-2345	2345	1.7	100	0	0	0
90-DU-2346	2346	0.0	100	0	0	0
90-DU-2347	2347	0.0	100	0	0	0
90-DU-2348	2348	0.0	100	0	0	0
90-DU-2351	2351	0.8	–	–	–	–
90-DU-2352	2352	0.0	100	0	0	0
90-DU-2355	2355	0.0	100	0	0	0
90-DU-2356	2356	0.0	100	0	0	0
90-DU-2359	2359	0.8	98	0	0	2
90-DU-2360	2360	–	–	–	–	–
90-DU-2361	2361	0.8	100	0	0	0
90-DU-2364	2364	0.8	100	0	0	0
90-DU-2366	2366	0.8	96	0	0	4
90-DU-2368	2368	0.8	100	0	0	0
90-DU-2371	2371	0.8	–	–	–	–
90-DU-2372	2372	–	98	0	0	2
90-DU-2373	2373	0.8	98	0	0	2
90-DU-2375	2375	0.0	98	0	0	2
90-DU-2377	2377	0.8	100	0	0	
90-DU-2378	2378	0.8	98	0	0	2
90-DU-2380	2380	0.0	100	0	0	0
90-DU-2382	2382	0.8	100	0	0	0
90-DU-2384	2384	0.8	98	0	0	2
90-DU-2385	2385	0.8	100	0	0	0
90-DU-2387	2387	0.8	100	0	0	0
90-DU-2390	2390	0.8	100	0	0	0
90-DU-2391	2391	0.0	100	0	0	0
90-DU-2392	2392	0.8	96	0	0	2
90-DU-2394	2394	0.0	100	0	0	0
90-DU-2396	2396	0.8	100	0	0	0
90-DU-2400	2400	1.7	–	–	–	–
90-DU-2401	2401	0.8	100	0	0	0
90-DU-2402	2402	0.8	100	0	0	0
90-DU-2403	2403	0.0	96	0	0	4
90-DU-2410	2410	–	92	0	0	8
90-DU-2412	2412	0.0	100	0	0	0
90-DU-2418	2418	11.7	82	18	0	0
90-DU-2419	2419	14.2	76	24	0	0
90-DU-2422	2422	18.3	68	32	0	0
90-DU-2424	2424	6.7	100	0	0	0
90-DU-2425	2425	39.2	78	22	0	0
90-DU-2426	2426	20.8	76	24	0	0
90-DU-2427	2427	46.7	72	26	0	2
90-DU-2429	2429	45.0	60	40	0	0
90-DU-2430	2430	26.7	80	18	0	2
90-DU-2433	2433	38.3	70	30	0	0
90-DU-2434	2434	36.7	58	18	0	24
90-DU-2435	2435	36.7	60	40	0	0
90-DU-2437	2437	3.3	100	0	0	0
90-DU-2438	2438	0.8	–	–	–	–
90-DU-2439	2439	–	78	22	0	0
90-DU-2440	2440	22.5	100	0	0	0
90-DU-2441	2441	–	88	12	0	2
90-DU-2443	2443	12.5	98	2	0	0
90-DU-2444	2444	43.3	92	8	0	0
90-DU-2447	2447	–	100	0	0	0
90-DU-2448	2448	0.8	100	0	0	0

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
90-DU-2449	2449	24.2	86	14	0	0
90-DU-2450	2450	7.5	98	2	0	0
90-DU-2451	2451	25.0	84	16	0	0
90-DU-2454	2454	3.3	–	–	–	–
90-DU-2455	2455	0.8	100	0	0	0
90-DU-2457	2457	0.0	96	0	0	4
90-DU-2458	2458	1.7	98	0	0	2
90-DU-2459	2459	0.8	98	0	0	2
90-DU-2460	2460	0.8	100	0	0	0
90-DU-2461	2461	0.0	100	0	0	0
90-DU-2462	2462	1.7	100	0	0	0
90-DU-2465	2465	0.8	100	0	0	0
90-DU-2467	2467	0.8	94	0	0	6
90-DU-2468	2468	0.8	100	0	0	0
90-DU-2471	2471	0.8	100	0	0	0
90-DU-2474	2474	0.0	96	0	0	4
90-DU-2475	2475	0.8	100	0	0	0
90-DU-2477	2477	0.8	100	0	0	0
90-DU-2478	2478	0.0	100	0	0	0
90-DU-2479	2479	0.8	100	0	0	0
90-DU-2480	2480	0.0	100	0	0	0
90-DU-2481	2481	0.8	100	0	0	0
90-DU-2482	2482	0.0	98	0	0	2
90-DU-2483	2483	0.8	100	0	0	0
90-DU-2484	2484	0.8	100	0	0	0
90-DU-2486	2486	3.3	100	0	0	0
90-DU-2488	2488	0.8	100	0	0	0
90-DU-2490	2490	0.0	98	0	0	2
90-DU-2491	2491	0.0	100	0	0	0
90-DU-2493	2493	0.0	100	0		0
90-DU-2494	2494	8.3	96	0	4	0
90-DU-2495	2495	10.0	98	0	2	0
90-DU-2496	2496	18.3	96	0	2	2
90-DU-2499	2499	0.0	100	0	0	0
90-DU-2500	2500	0.0	100	0	0	0
90-DU-2501	2501	0.8	100	0	0	0
90-DU-2503	2503	0.0	100	0	0	0
90-DU-2504	2504	0.0	100	0	0	0
90-DU-2505	2505	0.0	100	0	0	0
90-DU-2507	2507	0.0	100	0	0	0
90-DU-2508	2508	0.8	100	0	0	0
90-DU-2510	2510	0.0	100	0	0	0
90-DU-2513	2513	0.8	100	0	0	0
90-DU-2514	2514	0.0	100	0	0	0
90-DU-2517	2517	0.0	100	0	0	0
90-DU-2520	2520	0.0	100	0	0	0
90-DU-2528	2528	0.8	100	0	0	0
90-DU-2529	2529	0.0	100	0	0	0
90-DU-2530	2530	0.0	100	0	0	0
90-DU-2531	2531	0.0	100	0	0	0
90-DU-2534	2534	0.0	100	0	0	0
90-DU-2536	2536	0.8	100	0	0	0
90-DU-2538	2538	0.0	100	0	0	0
90-DU-2539	2539	0.0	100	0	0	0
90-DU-2540	2540	0.8	100	0	0	0
90-DU-2541	2541	0.0	100	0	0	0
90-DU-2542	2542	0.0	100	0	0	0
90-DU-2543	2543	0.0	98	0	0	2
90-DU-2544	2544	0.8	96	0	0	4
90-DU-2545	2545	0.8	100	0	0	0
90-DU-2546	2546	0.8	98	0	0	2
90-DU-2548	2548	0.0	100	0	0	0
90-DU-2551	2551	0.8	100	0	0	0
90-DU-2552	2552	0.0	–	–	–	–
90-DU-2553	2553	0.0	100	0	0	0
90-DU-2554	2554	1.7	100	0	0	0
90-DU-2555	2555	1.7	100	0	0	0
90-DU-2559	2559	0.0	100	0	0	0
90-DU-2561	2561	0.8	100	0	0	0

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
90-DU-2562	2562	0.8	100	0	0	0
90-DU-2564	2564	0.8	100	0	0	0
90-DU-2567	2567	0.8	100	0	0	0
90-DU-2568	2568	0.0	100	0	0	0
90-DU-2571	2571	0.8	100	0	0	0
90-DU-2573	2573	0.8	98	0	0	2
90-DU-2576	2576	0.0	100	0	0	0
90-DU-2577	2577	0.0	96	0	0	4
90-DU-2578	2578	0.8	100	0	0	0
90-DU-2580	2580	0.8	100	0	0	0
90-DU-2581	2581	0.8	100	0	0	0
90-DU-2582	2582	0.8	100	0	0	0
90-DU-2583	2583	0.0	100	0	0	0
90-DU-2585	2585	0.8	100	0	0	0
90-DU-2587	2587	0.8	94	0	0	6
90-DU-2588	2588	8.3	72	0	28	0
90-DU-2590	2590	0.8	100	0	0	0
90-DU-2591	2591	0.0	100	0	0	0
90-DU-2592	2592	0.0	100	0	0	0
90-DU-2593	2593	0.0	100	0	0	0
90-DU-2595	2595	0.0	100	0	0	0
90-DU-2596	2596	0.8	100	0	0	0
90-DU-2597	2597	0.8	100	0	0	0
90-DU-2598	2598	26.7	86	12	0	2
90-DU-2600	2600	0.8	100	0	0	0
90-DU-2601	2601	0.8	100	0	0	0
90-DU-2602	2602	0.0	100	0	0	0
90-DU-2606	2606	50.0	94	6	0	0
90-DU-2607	2607	48.3	84	16	0	0
90-DU-2608	2608	0.8	100	–	–	–
90-DU-2610	2610	0.0	100	0	0	0
90-DU-2611	2611	0.8	98	0	0	2
90-DU-2612	2612	–	72	28	0	0
90-DU-2615	2615	41.7	64	36	0	0
90-DU-2616	2616	40.0	82	18	0	0
91-DU-2617	2617	96.7	70	30	0	0
91-DU-3001	3001	1.7	100	0	0	0
91-DU-3002	3002	1.7	100	0	0	0
91-DU-3003	3003	0.0	100	0	0	0
91-DU-3004	3004	1.0	100	0	0	0
91-DU-3005	3005	1.0	100	0	0	0
91-DU-3006	3006	80.0	100	0	0	0
91-DU-3007	3007	24.0	100	0	0	0
91-DU-3008	3008	2.0	100	0	0	0
91-DU-3011	3011	5.0	94	6	0	0
91-DU-3013	3013	0.0	100	0	0	0
91-DU-3015	3015	0.0	100	0	0	0
91-DU-3017	3017	10.0	88	6	6	0
91-DU-3018	3018	0.0	100	0	0	0
91-DU-3019	3019	1.0	100	0	0	0
91-DU-3020	3020	1.0	100	0	0	0
91-DU-3021	3021	1.0	100	0	0	0
91-DU-3022	3022	9.0	90	10	0	0
91-DU-3023	3023	8.0	100	0	0	0
91-DU-3024	3024	1.0	100	0	0	0
91-DU-3025	3025	3.0	100	0	0	0
91-DU-3030	3030	2.0	100	0	0	0
91-DU-3035	3035	1.0	100	0	0	0
91-DU-3043	3043	13.0	100	0	0	0
91-DU-3044	3044	3.0	98	2	0	0
91-DU-3045	3045	2.0	100	0	0	0
91-DU-3046	3046	2.0	96	4	0	0
91-DU-3049	3049	0.0	100	0	0	0
91-DU-3051	3051	0.0	100	0	0	0
91-DU-3052	3052	1.0	100	0	0	0
91-DU-3054	3054	0.0	100	0	0	0
91-DU-3055	3055	0.0	100	0	0	0
91-DU-3056	3056	1.0	100	0	0	0
91-DU-3057	3057	3.0	100	0	0	0

Appendix C. (cont.)

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
91-DU-3058	3058	3.0	100	0	0	0
91-DU-3063	3063	1.0	100	0	0	0
91-DU-3064	3064	2.0	100	0	0	0
91-DU-3065	3065	4.0	100	0	0	0
91-DU-3067	3067	0.0	100	0	0	0
91-DU-3068	3068	0.0	100	0	0	0
91-DU-3071	3071	0.0	100	0	0	0
91-DU-3078	3078	1.0	100	0	0	0
91-DU-3082	3082	1.0	100	0	0	0
91-DU-3086	3086	2.0	100	0	0	0
91-DU-3089	3089	2.0	100	0	0	0
91-DU-3090	3090	3.0	98	0	2	2
91-DU-3093	3093	22.0	100	0	0	0
91-DU-3095	3095	1.0	100	0	0	0
91-DU-3096	3096	2.0	100	0	0	0
91-DU-3097	3097	8.0	78	0	22	0
91-DU-3109	3109	3.0	100	0	0	0
91-DU-3114	3114	1.0	100	0	0	0
91-DU-3115	3115	1.0	100	0	0	0
91-DU-3117	3117	0.0	100	0	0	0
91-DU-3123	3123	2.0	100	0	0	0
91-DU-3130	3130	2.0	100	0	0	0
91-DU-3131	3131	1.0	100	0	0	0
91-DU-3133	3133	1.0	100	0	0	0
91-DU-3138	3138	1.0	100	0	0	0
91-DU-3141	3141	1.0	100	0	0	0
91-DU-3142	3142	0.0	100	0	0	0
91-DU-3145	3145	1.0	100	0	0	0
91-DU-3146	3146	2.0	100	0	0	0
91-DU-3147	3147	1.0	100	0	0	0
91-DU-3149	3149	0.0	100	0	0	0
91-DU-3152	3152	0.0	100	0	0	0
91-DU-3155	3155	1.0	100	0	0	0
91-DU-3157	3157	1.0	100	0	0	0
91-DU-3158	3158	1.0	100	0	0	0
91-DU-3159	3159	1.0	100	0	0	0
91-DU-3161	3161	1.0	100	0	0	0
91-DU-3163	3163	3.0	100	0	0	0
91-DU-3165	3165	0.0	100	0	0	0
91-DU-3167	3167	1.0	100	0	0	0
91-DU-3172	3172	0.0	100	0	0	0
91-DU-3173	3173	0.0	100	0	0	0
91-DU-3176	3176	1.0	100	0	0	0
91-DU-3180	3180	3.0	100	0	0	0
91-DU-3181	3181	0.0	100	0	0	0
91-DU-3184	3184	1.0	100	0	0	0
91-DU-3186	3186	1.0	100	0	0	0
91-DU-3188	3188	2.0	100	0	0	0
91-DU-3192	3192	2.0	100	0	0	0
91-DU-3193	3193	0.0	100	0	0	0
91-DU-3197	3197	0.0	100	0	0	0
91-DU-3200	3200	0.0	100	0	0	0
91-DU-3203	3203	0.0	100	0	0	0
91-DU-3205	3205	1.0	100	0	0	0
91-DU-3206	3206	1.0	100	0	0	0
91-DU-3207	3207	1.0	100	0	0	0
91-DU-3208	3208	1.0	100	0	0	0
91-DU-3210	3210	3.0	100	0	0	0
91-DU-3213	3213	0.0	98	0	2	2
91-DU-3214	3214	2.0	100	0	0	0
91-DU-3216	3216	0.0	100	0	0	0
91-DU-3221	3221	0.0	100	0	0	0
91-DU-3222	3222	0.0	30	70	0	0
91-DU-3226	3226	0.0	100	0	0	0
91-DU-3227	3227	0.0	100	0	0	0
91-DU-3228	3228	0.0	100	0	0	0
91-DU-3231	3231	0.0	100	0	0	0
91-DU-3233	3233	1.0	100	0	0	0
91-DU-3235	3235	1.0	100	0	0	0

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
91-DU-3238	3238	0.0	98	2	0	0
91-DU-3239	3239	0.0	100	0	0	0
91-DU-3241	3241	0.0	100	0	0	0
91-DU-3243	3243	1.0	100	0	0	0
91-DU-3247	3247	0.0	100	0	0	0
91-DU-3248	3248	1.0	100	0	0	0
91-DU-3250	3250	0.0	100	0	0	0
91-DU-3251	3251	0.0	100	0	0	0
91-DU-3252	3252	0.0	100	0	0	0
91-DU-3253	3253	0.0	100	0	0	0
91-DU-3255	3255	1.0	100	0	0	0
91-DU-3257	3257	0.0	100	0	0	0
91-DU-3260	3260	0.0	100	0	0	0
91-DU-3262	3262	1.0	100	0	0	0
91-DU-3264	3264	0.0	100	0	0	0
91-DU-3267	3267	0.0	100	0	0	0
91-DU-3269	3269	2.0	100	0	0	0
91-DU-3272	3272	0.0	100	0	0	0
91-DU-3274	3274	13.0	96	4	0	0
91-DU-3276	3276	0.0	100	0	0	0
91-DU-3277	3277	8.0	96	0	4	4
91-DU-3278	3278	35.0	54	46	0	0
91-DU-3279	3279	0.0	100	0	0	0
91-DU-3280	3280	1.0	100	0	0	0
91-DU-3281	3281	1.0	100	0	0	0
91-DU-3282	3282	3.0	100	0	0	0
91-DU-3283	3283	0.0	100	0	0	0
91-DU-3284	3284	38.0	74	26	0	0
91-DU-3285	3285	52.0	76	24	0	0
91-DU-3288	3288	0.0	100	0	0	0
91-DU-3290	3290	1.0	100	0	0	0
91-DU-3293	3293	0.0	100	0	0	0
91-DU-3295	3295	14.0	96	2	2	2
91-DU-3297	3297	22.0	100	0	0	0
91-DU-3300	3300	0.0	100	0	0	0
91-DU-3301	3301	0.0	100	0	0	0
91-DU-3304	3304	0.0	100	0	0	0
91-DU-3307	3307	0.0	100	0	0	0
91-DU-3309	3309	0.0	100	0	0	0
91-DU-3311	3311	0.0	100	0	0	0
91-DU-3312	3312	0.0	100	0	0	0
91-DU-3315	3315	0.0	100	0	0	0
91-DU-3317	3317	1.0	100	0	0	0
91-DU-3320	3320	1.0	100	0	0	0
91-DU-3321	3321	1.0	100	0	0	0
91-DU-3323	3323	1.0	100	0	0	0
91-DU-3324	3324	0.0	100	0	0	0
91-DU-3327	3327	0.0	100	0	0	0
91-DU-3330	3330	0.0	100	0	0	0
91-DU-3331	3331	5.0	100	0	0	0
91-DU-3334	3334	2.0	100	0	0	0
91-DU-3335	3335	0.0	62	38	0	0
91-DU-3337	3337	6.0	90	10	0	0
91-DU-3338	3338	12.0	100	0	0	0
91-DU-3341	3341	14.0	84	16	0	0
91-DU-3342	3342	26.0	100	0	0	0
91-DU-3344	3344	64.0	100	0	0	0
91-DU-3345	3345	26.0	78	22	0	0
91-DU-3346	3346	37.0	36	64	0	0
91-DU-3347	3347	1.0	100	0	0	0
91-DU-3348	3348	1.0	100	0	0	0
91-DU-3349	3349	0.0	100	0	0	0
91-DU-3350	3350	0.0	100	0	0	0
91-DU-3352	3352	49.0	100	0	0	0
91-DU-3355	3355	1.0	100	0	0	0
91-DU-3356	3356	1.0	100	0	0	0
91-DU-3357	3357	0.0	100	0	0	0
91-DU-3359	3359	0.0	100	0	0	0
91-DU-3362	3362	1.0	100	0	0	0

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
91-DU-3364	3364	1.0	100	0	0	0
91-DU-3365	3365	0.0	100	0	0	0
91-DU-3366	3366	0.0	100	0	0	0
91-DU-3370	3370	0.0	100	0	0	0
91-DU-3373	3373	0.0	100	0	0	0
91-DU-3375	3375	8.0	100	0	0	0
91-DU-3376	3376	3.0	100	0	0	0
91-DU-3379	3379	40.0	98	2	0	0
91-DU-3382	3382	1.0	100	0	0	0
91-DU-3383	3383	5.0	94	0	6	0
91-DU-3384	3384	2.0	68	0	32	0
91-DU-3385	3385	1.0	100	0	0	0
91-DU-3387	3387	1.0	100	0	0	0
91-DU-3389	3389	2.0	100	0	0	0
91-DU-3392	3392	0.0	100	0	0	0
91-DU-3394	3394	0.0	100	0	0	0
91-DU-3396	3396	0.0	100	0	0	0
91-DU-3398	3398	3.0	100	0	0	0
91-DU-3401	3401	0.0	100	0	0	0
91-DU-3403	3403	0.0	100	0	0	0
91-DU-3404	3404	0.0	100	0	0	0
91-DU-3407	3407	1.0	100	0	0	0
91-DU-3408	3408	0.0	100	0	0	0
91-DU-3409	3409	0.0	100	0	0	0
91-DU-3410	3410	0.0	100	0	0	0
91-DU-3411	3411	0.0	100	0	0	0
91-DU-3413	3413	3.0	96	4	0	0
91-DU-3415	3415	1.0	100	0	0	0
91-DU-3417	3417	0.0	98	2	0	0
91-DU-3418	3418	13.0	100	0	0	0
91-DU-3420	3420	51.0	46	54	0	0
91-DU-3425	3425	0.0	–	–	–	–
91-DU-3427	3427	0.0	–	–	–	–

Sample	Station	$CaCO_3$ (%) (<0.063 mm)	Pebble lithology (%)			
			Granite	Limestone	Marble	Other
91-DU-3430	3430	0.0	–	–	–	–
91-DU-3431	3431	0.0	–	–	–	–
91-DU-3432	3432	0.0	–	–	–	–
91-DU-3433	3433	0.0	–	–	–	–
91-DU-3435	3435	0.0	–	–	–	–
91-DU-3436	3436	1.0	–	–	–	–
91-DU-3437	3437	0.0	–	–	–	–
91-DU-3438	3438	2.0	100	0	0	0
91-DU-3439	3439	3.0	100	0	0	0
91-DU-3440	3440	1.0	100	0	0	0
91-DU-3441	3441	1.0	100	0	0	0
91-DU-3443	3443	3.0	100	0	0	0
91-DU-3445	3445	2.0	100	0	0	0
91-DU-3446	3446	0.0	100	0	0	0
91-DU-3447	3447	0.0	100	0	0	0
91-DU-3448	3448	0.0	100	0	0	0
91-DU-3449	3449	1.0	100	0	0	0
91-DU-3450	3450	3.0	100	0	0	0
91-DU-3451	3451	1.0	100	0	0	0
91-DU-3452	3452	1.0	100	0	0	0
91-DU-3453	3453	1.0	100	0	0	0
91-DU-3454	3454	1.0	100	0	0	0
91-DU-3455	3455	3.0	100	0	0	0
91-DU-3456	3456	0.0	100	0	0	0
91-DU-3457	3457	2.0	100	0	0	0
91-DU-3458	3458	1.0	100	0	0	0
91-DU-3459	3459	0.0	100	0	0	0
91-DU-3460	3460	80.0	–	–	–	–
91-DU-3462	3462	21.0	–	–	–	–
91-DU-3476	3476	91.0	–	–	–	–
91-DU-3477	3477	75.0	–	–	–	–
91-DU-3478	3478	33.0	–	–	–	–
91-DU-3479	3479	28.0	–	–	–	–

Appendix D

Trace-element geochemistry for till samples.

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
90-DU-2001	2001	0.3	3.19	7	–	168	–	2.5	1.66	0.3	19	74	54	5.4	5	–	0.93	75	57	3.01
90-DU-2007	2007	0.4	4.72	9	–	165	–	2.5	0.5	0.3	24	100	93	7.46	15	–	1.32	115	70	3.57
90-DU-2009	2009	0.6	3.82	3	–	149	–	2.5	3.75	0.3	21	100	44	6.28	12	–	1.43	87	62	3.45
90-DU-2010	2010	0.6	5.7	28	–	112	–	2.5	0.41	0.3	24	115	58	7.97	15	–	0.96	57	75	2.66
90-DU-2011	2011	0.9	5.73	24	–	169	–	2.5	0.34	0.3	30	147	95	9.56	16	–	2.19	47	110	3.88
90-DU-2012	2012	1	5.27	57	–	160	–	2.5	0.45	0.3	29	123	151	9.36	14	–	1.64	64	101	3.36
90-DU-2018	2018	0.6	1.89	3	–	113	–	2.5	2.41	0.3	10	52	20	2.96	5	–	0.98	47	46	3.06
90-DU-2019	2019	0.6	2.67	9	–	125	–	2.5	10	0.3	13	62	51	4.19	5	–	0.91	60	50	2.74
90-DU-2020	2020	0.7	2.78	18	–	121	–	2.5	10	0.3	13	64	39	4.41	5	–	1.1	73	55	2.99
90-DU-2023	2023	0.7	1.41	9	–	78	–	2.5	3.23	0.3	8	30	21	2.07	5	–	0.54	39	29	2.12
90-DU-2025	2025	0.2	3.21	3	–	159	–	2.5	3.38	0.3	16	77	59	5.45	5	–	1.13	52	45	2.42
90-DU-2028	2028	0.8	1.71	6	–	90	–	2.5	3.04	0.3	9	37	23	2.46	5	–	0.66	44	33	2.13
90-DU-2029	2029	0.5	2.61	13	–	132	–	2.5	3.7	0.3	15	71	72	4.91	5	–	0.88	44	43	2.34
90-DU-2032	2032	0.5	3.56	10	–	147	–	2.5	6.32	0.3	16	81	36	5.89	10	–	1.39	76	60	2.78
90-DU-2032	2032	0.4	2.82	6	–	167	–	2.5	1.47	0.3	19	79	64	4.96	5	–	0.72	54	46	2.26
90-DU-2039	2039	0.9	2.59	8	–	154	–	2.5	1.95	0.3	13	69	37	4.07	5	–	1.19	64	53	3.23
90-DU-2041	2041	0.8	5.83	29	–	288	–	2.5	0.76	0.3	32	177	158	16	12	–	2.39	82	94	4.74
90-DU-2042	2042	0.5	5.33	7	–	184	–	2.5	1.87	0.3	23	113	75	8.36	15	–	1.77	91	97	5.58
90-DU-2043	2043	0.5	5.43	3	–	190	–	2.5	0.48	0.3	24	110	82	8.82	15	–	1.99	96	91	4.55
90-DU-2044	2044	0.4	4.26	13	–	108	–	2.5	0.36	0.3	23	105	80	7.13	11	–	0.88	77	62	2.95
90-DU-2045	2045	0.1	1.45	3	–	47	–	2.5	1.12	0.3	13	53	41	3.85	5	–	0.39	50	13	1.05
90-DU-2046	2046	0.5	4.49	10	–	163	–	2.5	1.56	0.3	24	111	88	8.43	11	–	1.63	93	74	3.62
90-DU-2047	2047	0.4	4.77	12	–	151	–	2.5	0.65	0.3	29	145	156	16	13	–	1.68	130	76	3.83
90-DU-2050	2050	0.2	5.5	13	–	220	–	2.5	0.62	0.3	37	547	111	9.16	13	–	1.39	88	75	5.76
90-DU-2051	2051	0.3	3.57	3	–	100	–	2.5	0.82	0.3	20	94	84	6.93	5	–	0.98	85	53	2.37
90-DU-2052	2052	0.3	3.84	3	–	109	–	2.5	0.65	0.3	18	89	109	6.08	11	–	1.05	110	64	2.73
90-DU-2053	2053	0.1	2.24	8	–	56	–	2.5	0.28	0.3	15	63	43	6.29	5	–	0.56	96	51	1.69
90-DU-2054	2054	0.5	5.3	9	–	146	–	2.5	0.63	0.3	19	93	64	8.16	19	–	1.24	123	112	5.6
90-DU-2055	2055	0.9	5.13	3	–	211	–	2.5	2.78	0.3	19	103	60	7.8	15	–	2.04	88	97	3.92
90-DU-2056	2056	0.5	4.17	3	–	212	–	2.5	0.85	0.3	20	114	68	7.07	11	–	1.67	103	70	3.29
90-DU-2057	2057	0.8	4.05	3	–	210	–	2.5	2.34	0.3	21	96	82	6.6	12	–	1.51	60	71	3.51
90-DU-2058	2058	0.9	2.2	6	–	122	–	2.5	2.44	0.3	10	57	27	3.3	5	–	1	50	47	2.96
90-DU-2061	2061	0.8	3.23	3	–	170	–	2.5	10	0.3	14	68	42	5.11	11	–	1.43	85	56	2.99
90-DU-2063	2063	0.7	3.77	3	–	178	–	2.5	6.22	0.3	17	76	52	5.84	5	–	1.38	79	59	3.24
90-DU-2064	2064	0.3	5.05	12	–	120	–	2.5	0.3	0.3	22	115	82	8.71	14	–	1.41	105	101	4.64
90-DU-2066	2066	0.5	5	10	–	216	–	2.5	0.37	0.3	25	97	82	9.97	13	–	1.42	170	74	5.61
90-DU-2067	2067	0.1	2.88	3	–	97	–	2.5	0.27	0.3	17	54	46	5.2	5	–	0.72	105	50	1.87
90-DU-2068	2068	0.2	3.78	3	–	108	–	2.5	0.3	0.3	20	107	49	6.58	11	–	0.92	57	55	2.46
90-DU-2070	2070	0.8	1.53	3	–	94	–	2.5	2.88	0.3	8	39	18	2.4	5	–	0.76	36	31	3.01
90-DU-2073	2073	0.7	4.97	37	–	162	–	2.5	1.08	0.3	30	109	158	9.74	11	–	1.53	87	83	3.5
90-DU-2074	2074	0.8	5.79	14	–	220	–	2.5	0.44	0.3	23	98	117	9.77	13	–	1.72	119	75	3.17
90-DU-2075	2075	0.9	5.25	34	–	152	–	2.5	0.34	0.3	22	92	107	16	11	–	1.19	90	77	2.72
90-DU-2076	2076	0.8	4.85	3	–	179	–	2.5	0.43	0.3	23	107	91	8.9	12	–	1.44	101	65	3.3
90-DU-2080	2080	0.1	1.79	3	–	83	–	2.5	0.74	0.3	13	48	36	4.52	5	–	0.4	65	20	1.23
90-DU-2081	2081	0.5	4.13	7	–	204	–	2.5	0.39	0.3	31	92	85	16	11	–	0.87	170	56	2.57
90-DU-2086	2086	1.5	4.17	9	–	35	–	2.5	0.09	0.3	21	102	190	16	5	–	1	71	30	1.94
90-DU-2087	2087	1	6.22	12	–	234	–	2.5	0.08	0.3	31	177	210	16	11	–	0.79	47	48	2.66

– No data available

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-2001	2001	600	0.5	2.5	49	25	2.5	–	10	19	41	5	0.19	–	–	64	5	15	106	2.5
90-DU-2007	2007	800	0.5	2.5	81	29	2.5	–	10	13	51	14	0.28	–	–	89	5	24	110	11
90-DU-2009	2009	500	0.5	2.5	60	22	2.5	–	10	37	56	14	0.28	–	–	88	5	17	116	12
90-DU-2010	2010	600	2	2.5	70	32	2.5	–	10	12	48	5	0.06	–	–	119	5	23	113	2.5
90-DU-2011	2011	700	2	2.5	108	26	2.5	–	10	9	59	11	0.3	–	–	145	5	19	136	34
90-DU-2012	2012	600	2	2.5	127	26	2.5	–	10	14	58	5	0.26	–	–	124	5	24	248	10
90-DU-2018	2018	400	3	6	34	13	2.5	–	10	101	63	5	0.16	–	–	45	5	17	71	2.5
90-DU-2019	2019	400	3	2.5	39	21	2.5	–	10	70	89	5	0.18	–	–	57	5	16	84	2.5
90-DU-2020	2020	400	2	2.5	39	17	2.5	–	10	77	80	5	0.21	–	–	59	5	14	89	12
90-DU-2023	2023	300	2	6	20	13	2.5	–	10	135	65	11	0.1	–	–	33	5	17	47	2.5
90-DU-2025	2025	500	0.5	2.5	47	14	2.5	–	10	33	60	5	0.22	–	–	64	5	14	93	2.5
90-DU-2028	2028	300	0.5	7	24	14	2.5	–	10	128	71	5	0.11	–	–	37	5	18	56	2.5
90-DU-2029	2029	400	0.5	2.5	51	24	2.5	–	10	29	49	10	0.18	–	–	58	5	14	82	2.5
90-DU-2032	2032	500	0.5	2.5	45	19	2.5	–	10	47	71	12	0.23	–	–	72	5	17	107	13
90-DU-2032	2032	500	0.5	2.5	56	21	2.5	–	10	19	38	5	0.12	–	–	52	5	15	78	2.5
90-DU-2039	2039	400	1	6	47	15	2.5	–	10	81	66	12	0.17	–	–	55	5	20	87	10
90-DU-2041	2041	800	5	2.5	100	43	2.5	–	10	16	85	5	0.35	–	–	144	5	20	219	10
90-DU-2042	2042	700	2	2.5	77	36	2.5	–	10	20	82	14	0.27	–	–	105	5	18	171	22
90-DU-2043	2043	700	2	2.5	67	35	2.5	–	10	15	63	5	0.29	–	–	103	5	16	144	15
90-DU-2044	2044	600	0.5	2.5	58	34	2.5	–	10	10	46	5	0.15	–	–	86	5	17	99	2.5
90-DU-2045	2045	300	0.5	2.5	26	20	2.5	–	10	21	25	5	0.1	–	–	53	5	18	41	2.5
90-DU-2046	2046	700	2	2.5	72	31	2.5	–	10	22	60	5	0.25	–	–	109	5	23	183	7
90-DU-2047	2047	700	3	2.5	96	42	2.5	–	10	19	60	13	0.28	–	–	123	5	22	230	25
90-DU-2050	2050	800	1	2.5	266	42	2.5	–	10	16	69	11	0.18	–	–	120	5	20	146	2.5
90-DU-2051	2051	600	0.5	2.5	60	32	2.5	–	10	19	27	5	0.12	–	–	93	5	24	124	2.5
90-DU-2052	2052	600	0.5	2.5	52	31	2.5	–	2000	16	29	5	0.25	–	–	71	5	22	106	2.5
90-DU-2053	2053	600	2	2.5	33	43	2.5	–	10	7	22	11	0.12	–	–	54	5	24	60	8
90-DU-2054	2054	600	0.5	2.5	69	39	2.5	–	10	11	64	15	0.27	–	–	121	5	24	161	25
90-DU-2055	2055	600	0.5	2.5	65	32	2.5	–	10	30	68	12	0.37	–	–	113	5	22	143	22
90-DU-2056	2056	600	0.5	2.5	71	22	2.5	–	10	24	47	13	0.34	–	–	87	5	18	133	13
90-DU-2057	2057	600	0.5	5	61	28	2.5	–	10	20	40	5	0.29	–	–	78	5	17	127	2.5
90-DU-2058	2058	400	0.5	5	35	16	2.5	–	10	90	75	11	0.16	–	–	45	5	20	69	2.5
90-DU-2061	2061	500	0.5	2.5	41	21	2.5	–	10	66	93	5	0.28	–	–	65	5	15	101	15
90-DU-2063	2063	600	0.5	2.5	50	22	2.5	–	10	45	75	5	0.3	–	–	67	5	17	114	16
90-DU-2064	2064	900	2	2.5	63	49	2.5	–	10	9	81	10	0.34	–	–	98	5	27	164	2.5
90-DU-2066	2066	700	4	2.5	75	35	2.5	–	10	9	76	5	0.34	–	–	105	5	33	170	2.5
90-DU-2067	2067	500	3	2.5	32	35	2.5	–	10	12	23	5	0.16	–	–	54	5	15	100	2.5
90-DU-2068	2068	600	2	2.5	66	34	2.5	–	10	13	26	5	0.2	–	–	77	5	11	99	2.5
90-DU-2070	2070	300	0.5	5	25	13	2.5	–	10	86	81	5	0.14	–	–	36	5	15	55	2.5
90-DU-2073	2073	600	4	5	126	40	2.5	–	10	19	65	12	0.29	–	–	120	5	23	317	2.5
90-DU-2074	2074	600	3	2.5	81	32	2.5	–	10	14	61	12	0.37	–	–	112	5	28	220	26
90-DU-2075	2075	500	6	2.5	105	42	2.5	–	10	14	40	5	0.21	–	–	114	5	28	307	7
90-DU-2076	2076	600	2	2.5	79	29	2.5	–	10	13	55	5	0.34	–	–	108	5	18	206	7
90-DU-2080	2080	400	0.5	2.5	33	14	2.5	–	10	15	23	5	0.04	–	–	55	5	15	68	2.5
90-DU-2081	2081	900	2	2.5	68	35	2.5	–	10	21	51	5	0.13	–	–	114	5	25	168	2.5
90-DU-2086	2086	200	25	6	79	49	2.5	–	10	74	41	5	0.06	–	–	128	5	9	151	2.5
90-DU-2087	2087	500	11	2.5	120	63	2.5	–	10	13	49	5	0.18	–	–	207	5	15	197	2.5

– No data available

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		0.2	0.01	5	1	10	0.5	5	0.01	0.5	1	1	1	0.01	10	1	0.01	1	10	0.01
90-DU-2089	2089	0.9	1.96	11	–	109	–	2.5	2.13	0.3	12	51	35	3.37	5	–	0.63	25	37	2.5
90-DU-2092	2092	0.8	4.19	15	–	230	–	2.5	0.35	0.3	26	165	97	8.52	12	–	1.1	63	53	3.81
90-DU-2094	2094	0.8	4.16	5	–	156	–	2.5	1.9	0.3	20	85	55	7.33	12	–	1.4	88	63	3.16
90-DU-2099	2099	0.8	5.64	14	–	209	–	2.5	0.37	0.3	22	95	97	9.47	11	–	1.09	101	51	2.54
90-DU-2100	2100	0.9	5.46	13	–	199	–	2.5	0.28	0.3	26	130	95	16	14	–	1.32	80	54	2.84
90-DU-2102	2102	0.4	2.52	6	–	29	–	2.5	0.04	0.3	7	58	47	3.77	5	–	0.11	53	10	0.39
90-DU-2106	2106	0.9	4.85	10	–	174	–	2.5	0.18	0.3	39	102	150	16	12	–	0.98	72	42	2.66
90-DU-2107	2107	0.9	3.97	3	–	248	–	2.5	0.19	0.3	36	86	83	8.74	5	–	0.89	37	31	2.96
90-DU-2108	2108	0.4	2.64	3	–	104	–	2.5	0.57	0.3	28	77	74	7.33	5	–	0.47	65	23	1.66
90-DU-2110	2110	0.7	3.56	10	–	226	–	2.5	0.38	0.3	44	109	135	8.46	5	–	0.87	48	38	2.72
90-DU-2114	2114	0.8	2.85	11	–	196	–	2.5	0.41	0.3	42	103	123	8.94	5	–	0.6	73	28	2.75
90-DU-2115	2115	1.1	3.85	16	–	268	–	2.5	0.29	0.3	32	149	116	9.87	5	–	1.02	34	37	3.33
90-DU-2116	2116	0.8	1.76	11	–	90	–	2.5	2.94	0.3	10	43	32	3.26	5	–	0.66	29	36	2.31
90-DU-2117	2117	0.1	4.44	3	–	135	–	2.5	0.26	0.3	26	126	66	9.18	14	–	1.31	108	71	2.98
90-DU-2118	2118	1	4.37	12	–	210	–	2.5	0.25	0.3	34	129	113	16	5	–	0.8	71	48	3.3
90-DU-2119	2119	0.5	2.28	3	–	126	–	2.5	0.45	0.3	34	106	122	7.13	5	–	0.4	60	24	1.71
90-DU-2123	2123	0.7	5.74	3	–	171	–	2.5	0.19	0.3	26	102	150	16	12	–	1.42	116	63	2.89
90-DU-2128	2128	0.7	5.74	5	–	188	–	2.5	0.23	0.3	30	121	113	16	15	–	1.95	148	70	3.67
90-DU-2131	2131	0.6	5.07	13	–	205	–	2.5	0.3	0.3	33	168	107	16	13	–	1.57	125	66	3.32
90-DU-2132	2132	0.2	5.25	3	–	230	–	2.5	0.41	0.3	33	112	122	16	16	–	1.44	139	78	3.4
90-DU-2135	2135	0.9	6.51	9	–	285	–	2.5	0.51	0.3	20	109	135	16	21	–	3.13	209	149	3.35
90-DU-2139	2139	0.8	4.13	3	–	277	–	2.5	0.46	0.3	35	230	127	9.64	5	–	0.97	83	69	4.61
90-DU-2140	2140	0.4	4.49	3	–	169	–	2.5	0.45	0.3	27	99	83	8.05	11	–	0.98	94	56	2.4
90-DU-2141	2141	1	4.68	7	–	319	–	2.5	0.36	0.3	35	256	96	9.16	13	–	1.53	86	88	5.13
90-DU-2142	2142	0.6	3.19	11	–	195	–	2.5	0.49	0.3	25	123	90	7.85	5	–	0.93	61	51	2.65
90-DU-2146	2146	1	4.21	3	–	290	–	2.5	0.4	0.3	39	127	220	16	5	–	1.21	55	56	4.24
90-DU-2148	2148	0.4	4.06	3	–	167	–	2.5	0.49	0.3	32	122	114	9.26	5	–	0.93	82	52	2.59
90-DU-2155	2155	0.8	1.39	3	–	50	–	2.5	3.33	0.3	7	35	19	1.89	5	–	0.47	20	31	1.89
90-DU-2156	2156	0.6	2.72	14	–	74	–	2.5	10	0.3	12	64	21	3.66	5	–	0.74	23	59	3.15
90-DU-2159	2159	0.1	5.12	11	–	215	–	2.5	0.41	0.3	27	108	148	9.12	15	–	1.76	236	93	3.37
90-DU-2170	2170	0.1	4.24	13	–	183	–	2.5	0.51	0.3	28	80	99	8.69	13	–	1.49	139	75	2.6
90-DU-2172	2172	0.1	1.68	3	–	24	–	15	0.05	0.3	11	43	108	2.03	10	–	1.72	14	42	0.97
90-DU-2173	2173	0.5	6.48	3	–	169	–	2.5	0.2	0.3	28	100	133	16	14	–	1.45	73	77	2.48
90-DU-2175	2175	0.7	6.13	3	–	230	–	2.5	1.1	0.3	20	119	62	8	15	–	2.73	89	102	4.73
90-DU-2176	2176	0.5	5.53	3	–	190	–	2.5	2	0.3	18	102	72	7.3	14	–	2.24	87	94	3.7
90-DU-2177	2177	0.5	4.52	6	–	175	–	2.5	0.83	0.3	19	80	82	5.61	11	–	1.4	79	64	2.55
90-DU-2178	2178	0.6	5.8	16	–	225	–	2.5	0.53	0.3	22	93	99	8.14	13	–	1.76	88	107	3.6
90-DU-2179	2179	0.7	5.79	9	–	260	–	2.5	1.01	0.3	22	113	125	8.7	15	–	2.12	103	108	3.74
90-DU-2181	2181	0.7	5.22	7	–	188	–	2.5	0.4	0.3	28	123	114	9.49	13	–	1.65	97	89	3.52
90-DU-2183	2183	0.6	5.16	6	–	179	–	2.5	0.52	0.3	25	135	114	9.19	15	–	2.22	107	86	3.85
90-DU-2184	2184	0.7	5.49	18	–	183	–	2.5	0.43	0.3	24	109	130	9	16	–	1.64	121	93	3.54
90-DU-2185	2185	0.1	2.34	3	–	60	–	2.5	0.9	0.3	17	92	77	5.94	5	–	0.72	148	36	2.03
90-DU-2186	2186	0.1	1.72	3	–	47	–	2.5	0.66	0.3	11	51	29	3.72	5	–	0.43	67	24	1.1
90-DU-2188	2188	0.6	5.98	3	–	146	–	2.5	0.24	0.3	26	140	106	16	19	–	2.03	106	101	3.89
90-DU-2190	2190	0.3	5.16	3	–	191	–	2.5	0.38	0.3	24	84	80	9.56	16	–	2.13	181	97	3.37
90-DU-2191	2191	0.5	5.49	3	–	162	–	2.5	0.4	0.3	27	160	146	16	16	–	1.95	106	95	3.56
90-DU-2195	2195	0.6	5.14	3	–	204	–	2.5	4.41	0.3	18	86	101	7.99	13	–	1.61	74	95	3.63
90-DU-2196	2196	0.9	5.97	9	–	225	–	2.5	0.53	0.3	22	109	147	9.47	14	–	1.66	90	100	4.24
90-DU-2197	2197	0.8	5.38	9	–	181	–	2.5	5.29	0.3	20	95	82	6.92	13	–	2.07	70	99	3.68
90-DU-2198	2198	0.5	6.22	9	–	219	–	2.5	1.17	0.3	22	121	104	7.92	14	–	2.52	89	83	4.18
90-DU-2199	2199	0.2	5.31	12	–	279	–	2.5	0.44	0.3	21	101	74	8.47	17	–	1.46	150	86	5.21
90-DU-2200	2200	0.1	5.33	15	–	228	–	2.5	0.39	0.3	19	109	92	9.61	16	–	1.26	161	88	4.64

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		5	1	5	1	2	5	1	20	1	10	10	0.01	10	10	1	10	1	2	5
90-DU-2089	2089	200	0.5	6	59	15	2.5	–	10	78	77	11	0.11	–	–	51	5	15	68	2.5
90-DU-2092	2092	500	2	2.5	142	33	2.5	–	10	12	43	12	0.32	–	–	103	5	15	157	2.5
90-DU-2094	2094	500	2	2.5	57	26	2.5	–	10	26	48	13	0.32	–	–	97	5	17	153	22
90-DU-2099	2099	400	5	2.5	90	28	2.5	–	10	13	44	13	0.22	–	–	121	5	28	203	6
90-DU-2100	2100	500	5	5	81	26	2.5	–	10	11	40	11	0.37	–	–	145	5	19	166	15
90-DU-2102	2102	200	3	8	21	20	2.5	–	10	4	11	5	0.07	–	–	54	5	19	30	2.5
90-DU-2106	2106	1000	7	5	102	31	2.5	–	10	10	37	10	0.25	–	–	110	5	20	248	2.5
90-DU-2107	2107	800	2	2.5	86	20	2.5	–	10	10	35	5	0.27	–	–	98	5	11	176	2.5
90-DU-2108	2108	500	3	2.5	61	18	2.5	–	10	19	53	12	0.04	–	–	89	5	18	117	2.5
90-DU-2110	2110	700	5	2.5	120	16	2.5	–	10	14	20	5	0.09	–	–	114	5	13	188	2.5
90-DU-2114	2114	1200	3	2.5	101	20	2.5	–	10	17	35	11	0.02	–	–	91	5	14	161	2.5
90-DU-2115	2115	500	3	2.5	121	20	2.5	–	10	18	43	12	0.2	–	–	114	5	10	215	2.5
90-DU-2116	2116	300	1	5	30	15	2.5	–	10	94	83	5	0.12	–	–	51	5	16	69	6
90-DU-2117	2117	900	2	2.5	66	44	2.5	–	10	10	34	5	0.08	–	–	106	5	18	156	2.5
90-DU-2118	2118	800	2	2.5	90	20	2.5	–	10	13	57	14	0.11	–	–	132	5	16	166	2.5
90-DU-2119	2119	900	2	2.5	82	23	2.5	–	10	18	32	5	0.03	–	–	97	5	13	109	2.5
90-DU-2123	2123	500	9	2.5	96	26	2.5	–	10	9	46	5	0.31	–	–	149	5	25	189	2.5
90-DU-2128	2128	600	8	2.5	93	26	2.5	–	10	9	79	10	0.39	–	–	169	5	23	203	2.5
90-DU-2131	2131	600	5	2.5	133	24	2.5	–	10	10	49	16	0.25	–	–	152	5	19	183	2.5
90-DU-2132	2132	900	4	2.5	87	34	2.5	–	10	16	63	12	0.33	–	–	136	5	17	202	2.5
90-DU-2135	2135	900	5	5	86	40	2.5	–	10	27	53	5	1.44	–	–	137	5	37	203	2.5
90-DU-2139	2139	700	2	2.5	222	22	2.5	–	10	17	57	14	0.32	–	–	99	5	18	146	2.5
90-DU-2140	2140	700	4	2.5	60	27	2.5	–	10	13	19	11	0.1	–	–	107	5	19	142	2.5
90-DU-2141	2141	700	2	2.5	236	21	2.5	–	10	16	48	12	0.41	–	–	101	5	17	168	2.5
90-DU-2142	2142	500	2	2.5	98	20	2.5	–	10	16	34	10	0.04	–	–	101	5	14	128	2.5
90-DU-2146	2146	600	8	2.5	162	21	2.5	–	10	14	40	14	0.22	–	–	122	5	14	347	2.5
90-DU-2148	2148	700	4	2.5	100	31	2.5	–	10	14	21	5	0.14	–	–	113	5	20	147	2.5
90-DU-2155	2155	200	0.5	5	25	11	2.5	–	10	120	22	11	0.07	–	–	36	5	16	47	2.5
90-DU-2156	2156	200	0.5	2.5	36	17	2.5	–	10	78	47	5	0.11	–	–	65	5	12	88	2.5
90-DU-2159	2159	700	3	2.5	76	38	2.5	–	10	18	36	12	0.4	–	–	128	5	26	185	10
90-DU-2170	2170	900	4	2.5	53	40	2.5	–	10	16	32	11	0.1	–	–	117	5	23	158	2.5
90-DU-2172	2172	300	64	2.5	43	49	2.5	–	10	26	2.5	5	0.03	–	–	113	5	9	83	2.5
90-DU-2173	2173	600	8	2.5	91	40	2.5	–	10	10	18	5	0.5	–	–	149	5	18	158	2.5
90-DU-2175	2175	600	1	2.5	76	29	2.5	–	10	21	53	12	0.53	–	–	114	5	18	115	17
90-DU-2176	2176	400	2	2.5	69	29	2.5	–	10	28	34	13	0.45	–	–	117	5	18	122	21
90-DU-2177	2177	500	0.5	2.5	62	30	2.5	–	10	22	18	5	0.37	–	–	80	5	25	84	6
90-DU-2178	2178	700	1	2.5	100	33	2.5	–	10	16	35	10	0.43	–	–	129	5	25	235	8
90-DU-2179	2179	700	2	2.5	92	41	2.5	–	10	21	44	10	0.44	–	–	129	5	22	223	12
90-DU-2181	2181	800	3	2.5	91	36	2.5	–	10	12	41	11	0.37	–	–	129	5	18	221	2.5
90-DU-2183	2183	800	1	2.5	76	32	2.5	–	10	21	44	5	0.41	–	–	115	5	15	195	12
90-DU-2184	2184	700	2	2.5	96	28	2.5	–	10	15	27	5	0.34	–	–	120	5	19	248	2.5
90-DU-2185	2185	600	1	2.5	40	26	2.5	–	10	24	18	5	0.16	–	–	81	5	21	92	2.5
90-DU-2186	2186	400	1	2.5	25	20	2.5	–	10	18	22	5	0.18	–	–	55	5	11	56	2.5
90-DU-2188	2188	900	2	2.5	71	37	2.5	–	10	10	37	5	0.39	–	–	122	5	13	190	2.5
90-DU-2190	2190	900	1	2.5	54	35	2.5	–	10	14	49	10	0.39	–	–	106	5	29	199	18
90-DU-2191	2191	900	2	2.5	80	41	2.5	–	10	12	45	5	0.2	–	–	132	5	22	191	2.5
90-DU-2195	2195	600	2	2.5	88	34	2.5	–	10	38	44	5	0.32	–	–	125	5	18	259	18
90-DU-2196	2196	600	3	2.5	116	33	2.5	–	10	16	32	11	0.36	–	–	148	5	25	302	10
90-DU-2197	2197	400	0.5	2.5	88	27	2.5	–	10	53	58	13	0.4	–	–	111	5	17	520	18
90-DU-2198	2198	500	0.5	2.5	82	28	2.5	–	10	27	41	5	0.51	–	–	121	5	17	104	13
90-DU-2199	2199	600	3	2.5	88	39	2.5	–	10	10	41	17	0.34	–	–	107	5	26	231	18
90-DU-2200	2200	600	2	5	72	46	2.5	–	10	9	43	12	0.32	–	–	115	5	38	175	2.5

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
90-DU-2201	2201	0.5	5.71	13	–	194	–	2.5	0.53	0.3	25	124	97	8.17	14	–	2.05	92	74	4.24
90-DU-2202	2202	0.6	5.5	3	–	194	–	2.5	1.24	0.3	20	119	59	7.53	14	–	2.17	62	73	3.92
90-DU-2203	2203	0.7	5.44	10	–	200	–	2.5	2.28	0.3	20	117	68	7.29	14	–	2.07	57	77	3.97
90-DU-2204	2204	0.5	6.15	12	–	242	–	2.5	0.63	0.3	24	112	108	9.15	16	–	1.81	92	109	4.32
90-DU-2205	2205	0.1	1.53	3	–	24	–	8	0	0.3	6	35	138	2.24	11	–	0.18	159	6	0.24
90-DU-2206	2206	0.8	5.07	17	–	224	–	2.5	7.53	0.3	20	79	106	7.53	13	–	1.68	82	110	3.22
90-DU-2207	2207	0.7	5.78	8	–	258	–	2.5	3.8	0.3	19	86	107	7.99	15	–	1.85	84	118	3.49
90-DU-2209	2209	0.6	5.98	11	–	232	–	2.5	1.28	0.3	20	90	88	8.61	16	–	1.91	110	123	3.98
90-DU-2210	2210	0.6	6.05	31	–	216	–	2.5	0.35	0.3	26	102	109	9.79	16	–	1.74	112	109	3.73
90-DU-2211	2211	0.7	6.03	40	–	279	–	2.5	0.42	0.3	23	97	84	8.84	16	–	1.6	116	110	3.99
90-DU-2213	2213	0.1	4.4	7	–	158	–	2.5	0.69	0.3	35	118	119	9.09	13	–	1.84	210	99	3.58
90-DU-2218	2218	0.6	5.25	6	–	218	–	2.5	0.47	0.3	22	107	65	9.44	20	–	1.62	136	82	4.37
90-DU-2219	2219	0.9	5.76	21	–	264	–	2.5	0.3	0.3	20	82	79	9.46	15	–	1.83	100	90	3.45
90-DU-2220	2220	1	5.34	10	–	220	–	2.5	1.87	0.3	17	98	107	9.26	13	–	1.42	67	89	3.37
90-DU-2221	2221	0.6	5.25	14	–	227	–	2.5	0.49	0.3	23	88	97	9	14	–	1.35	86	95	3.51
90-DU-2221	2221	3.6	1.36	3	–	10	–	22	0.02	0.3	3	41	10	2.13	5	–	2.8	3	18	0.65
90-DU-2223	2223	0.9	5.75	15	–	170	–	2.5	2.47	0.3	22	110	91	7.74	14	–	1.65	63	96	4.52
90-DU-2225	2225	2.6	1.57	3	–	13	–	19	0	0.3	3	35	65	2.11	11	–	2.99	0.5	11	0.28
90-DU-2226	2226	0.2	3.95	8	–	187	–	2.5	0.36	0.3	17	73	33	6.15	11	–	1.01	75	63	2.35
90-DU-2227	2227	0.9	5.89	20	–	183	–	2.5	1	0.3	19	102	93	8.93	16	–	1.72	107	96	3.8
90-DU-2229	2229	0.9	5.24	35	–	129	–	2.5	2	0.3	16	89	130	9.46	12	–	1.44	72	101	3.6
90-DU-2230	2230	1	4.69	19	–	150	–	2.5	2.83	0.3	16	89	101	8.83	16	–	1.22	60	79	3.76
90-DU-2231	2231	0.9	4.52	12	–	167	–	2.5	2.18	0.3	15	83	70	8.08	13	–	1.09	56	63	3.44
90-DU-2233	2233	0.7	5.4	14	–	136	–	2.5	0.31	0.3	18	102	94	9.55	18	–	1.28	74	81	4.9
90-DU-2235	2235	0.1	5.03	13	–	147	–	2.5	0.36	0.3	34	81	83	16	13	–	1.21	148	89	3.46
90-DU-2237	2237	0.7	6.23	3	–	194	–	2.5	0.29	0.3	20	111	59	16	16	–	2.35	85	126	3.61
90-DU-2240	2240	0.7	6.44	3	–	150	–	2.5	2.15	0.3	16	96	65	8.83	18	–	2.19	119	106	3.4
90-DU-2241	2241	1	7.15	19	–	192	–	2.5	0.24	0.3	18	125	98	16	20	–	2.85	80	112	3.68
90-DU-2244	2244	0.6	7.14	21	–	154	–	2.5	0.26	0.3	22	111	73	9.58	19	–	2.63	92	142	4.05
90-DU-2245	2245	1.2	5.62	3	–	207	–	2.5	0.5	0.3	35	98	225	16	15	–	2.35	112	107	3.75
90-DU-2245	2245	0.1	0.9	3	–	17	–	14	0.04	0.3	9	49	32	2.34	12	–	3.24	42	18	0.67
90-DU-2248	2248	0.9	6.95	19	–	127	–	2.5	0.19	0.3	34	94	150	9.34	14	–	1.46	61	95	3.24
90-DU-2250	2250	0.7	7.25	20	–	278	–	2.5	0.25	0.3	25	75	85	16	15	–	2.72	99	107	3.29
90-DU-2252	2252	0.7	6.14	67	–	132	–	2.5	3.72	0.3	23	80	131	8.92	13	–	1.91	96	136	3.25
90-DU-2254	2254	0.4	6.93	29	–	176	–	2.5	0.8	0.3	24	89	116	16	17	–	2.11	185	144	3.09
90-DU-2257	2257	3.8	0.92	22	–	36	–	2.5	0.17	0.3	2	103	31	16	5	–	0.49	15	16	0.49
90-DU-2258	2258	0.8	6.22	3	–	85	–	2.5	0.19	0.3	22	152	4	5.12	11	–	1.79	20	78	4.15
90-DU-2259	2259	0.6	6.29	18	–	191	–	2.5	4.17	0.3	25	88	102	7.61	13	–	1.99	85	108	3.7
90-DU-2264	2264	0.6	4.12	20	–	130	–	2.5	0.99	0.3	15	86	66	6.94	11	–	1.53	70	55	2.95
90-DU-2269	2269	0.1	1.49	3	–	48	–	2.5	0.02	0.3	11	37	38	3.24	5	–	0.34	67	16	0.92
90-DU-2271	2271	0.1	1.52	3	–	27	–	2.5	0.59	0.3	7	35	28	2.35	5	–	0.16	57	9	0.56
90-DU-2272	2272	0.1	0.85	3	–	25	–	2.5	1.25	0.3	6	33	14	2.86	5	–	0.17	38	6	0.66
90-DU-2276	2276	0.1	1.42	3	–	43	–	2.5	1.38	0.3	11	49	29	4.11	5	–	0.37	60	12	1.15
90-DU-2277	2277	0.1	2.65	3	–	81	–	2.5	1.26	0.3	10	53	38	4.11	5	–	0.69	67	30	1.4
90-DU-2278	2278	0.3	3.97	6	–	326	–	2.5	0.8	0.3	37	799	55	6.34	5	–	0.96	64	41	6.07
90-DU-2279	2279	0.5	4.33	3	–	145	–	2.5	0.73	0.3	17	157	96	7.46	14	–	1.69	71	55	2.87
90-DU-2280	2280	0.5	3.77	3	–	121	–	2.5	1.07	0.3	12	67	51	5.61	10	–	1.27	68	51	1.89
90-DU-2281	2281	0.3	4.06	8	–	112	–	2.5	0.8	0.3	18	96	84	7.33	10	–	1.35	70	55	2.62
90-DU-2285	2285	0.9	1.54	7	–	81	–	2.5	3.28	0.3	6	28	25	2.35	5	–	0.59	48	29	1.53
90-DU-2286	2286	0.6	2.82	7	–	140	–	2.5	1.62	0.3	10	47	41	4.06	5	–	0.87	44	28	1.48
90-DU-2288	2288	0.8	2.26	7	–	119	–	2.5	2.61	0.3	9	45	26	3.4	5	–	1.07	49	40	2.38
90-DU-2290	2290	0.1	1.49	3	–	48	–	2.5	0.75	0.3	9	35	36	3.25	5	–	0.32	53	19	0.84

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-2201	2201	400	1	2.5	91	30	2.5	–	10	15	37	11	0.33	–	–	119	5	19	123	2.5
90-DU-2202	2202	400	0.5	2.5	72	24	2.5	–	10	24	51	5	0.4	–	–	114	5	13	83	12
90-DU-2203	2203	400	0.5	2.5	81	22	2.5	–	10	29	36	5	0.39	–	–	118	5	15	117	14
90-DU-2204	2204	600	2	2.5	115	29	2.5	–	10	16	45	12	0.36	–	–	134	5	25	258	2.5
90-DU-2205	2205	100	47	2.5	11	21	9	–	10	4	2.5	5	0.03	–	–	45	5	29	51	2.5
90-DU-2206	2206	500	5	2.5	119	30	2.5	–	10	62	48	5	0.32	–	–	128	5	26	309	17
90-DU-2207	2207	600	2	2.5	100	31	2.5	–	10	42	35	12	0.36	–	–	126	5	21	270	15
90-DU-2209	2209	600	2	2.5	86	39	2.5	–	10	20	52	5	0.37	–	–	118	5	23	245	25
90-DU-2210	2210	700	3	2.5	96	43	2.5	–	10	11	49	5	0.38	–	–	129	5	28	206	2.5
90-DU-2211	2211	600	2	2.5	91	43	2.5	–	10	13	43	11	0.32	–	–	117	5	28	270	9
90-DU-2213	2213	1100	1	2.5	70	37	2.5	–	10	21	43	11	0.03	–	–	107	5	28	181	2.5
90-DU-2218	2218	800	0.5	2.5	66	36	2.5	–	10	10	34	13	0.32	–	–	115	5	17	179	15
90-DU-2219	2219	600	3	2.5	75	23	2.5	–	10	12	27	14	0.32	–	–	120	5	19	209	15
90-DU-2220	2220	500	6	2.5	104	35	2.5	–	10	27	34	10	0.29	–	–	147	5	21	331	17
90-DU-2221	2221	700	2	2.5	100	31	2.5	–	10	13	32	10	0.28	–	–	129	5	22	250	2.5
90-DU-2221	2221	100	55	2.5	3	22	6	–	10	42	2.5	5	0.05	–	–	108	5	7	36	2.5
90-DU-2223	2223	500	1	2.5	93	31	2.5	–	10	30	45	5	0.32	–	–	126	5	20	141	19
90-DU-2225	2225	100	15	2.5	5	52	2.5	–	10	10	2.5	5	0.04	–	–	132	5	6	44	9
90-DU-2226	2226	600	0.5	2.5	47	27	2.5	–	10	16	19	11	0.22	–	–	68	5	13	95	2.5
90-DU-2227	2227	500	0.5	2.5	76	30	2.5	–	10	21	54	12	0.35	–	–	121	5	21	167	10
90-DU-2229	2229	500	7	2.5	135	33	2.5	–	10	32	43	5	0.26	–	–	125	5	23	423	11
90-DU-2230	2230	500	4	2.5	97	20	2.5	–	10	32	51	18	0.25	–	–	124	5	18	390	2.5
90-DU-2231	2231	500	0.5	2.5	60	23	2.5	–	10	23	35	15	0.26	–	–	101	5	14	232	11
90-DU-2233	2233	600	4	2.5	81	28	2.5	–	10	9	44	10	0.27	–	–	124	5	16	288	15
90-DU-2235	2235	900	4	2.5	74	51	2.5	–	10	16	36	13	0.08	–	–	113	5	29	212	2.5
90-DU-2237	2237	600	2	5	71	40	2.5	–	10	10	42	11	0.36	–	–	120	5	19	187	2.5
90-DU-2240	2240	600	2	2.5	66	57	2.5	–	10	36	46	13	0.35	–	–	113	5	28	220	35
90-DU-2241	2241	800	3	2.5	138	42	2.5	–	10	11	45	11	0.46	–	–	162	5	24	416	19
90-DU-2244	2244	600	2	2.5	78	53	2.5	–	10	10	2.5	10	0.38	–	–	119	5	27	189	21
90-DU-2245	2245	700	41	6	334	36	2.5	–	10	10	2.5	16	0.39	–	–	153	5	41	163	2.5
90-DU-2245	2245	200	0.5	2.5	20	71	6	–	10	103	2.5	5	0.04	–	–	81	5	9	47	2.5
90-DU-2248	2248	600	8	2.5	140	59	2.5	–	10	11	2.5	12	0.23	–	–	125	5	26	530	2.5
90-DU-2250	2250	500	4	2.5	92	34	2.5	–	10	14	2.5	11	0.42	–	-	125	5	22	181	15
90-DU-2252	2252	600	4	2.5	115	44	2.5	–	10	59	2.5	11	0.28	–	–	108	5	29	288	13
90-DU-2254	2254	800	2	2.5	105	51	2.5	–	10	40	2.5	5	0.32	–	–	114	5	36	324	9
90-DU-2257	2257	100	32	2.5	56	43	2.5	–	10	7	2.5	10	-0.01	–	–	72	5	5	18	2.5
90-DU-2258	2258	300	1	2.5	70	12	2.5	–	10	5	2.5	5	0.07	–	–	87	5	14	17	2.5
90-DU-2259	2259	500	0.5	2.5	99	35	2.5	–	10	56	2.5	14	0.37	–	–	110	5	27	160	5
90-DU-2264	2264	500	1	2.5	60	30	2.5	–	10	21	2.5	11	0.33	–	–	82	5	20	142	7
90-DU-2269	2269	400	1	2.5	22	16	2.5	–	10	17	2.5	5	0.1	–	–	36	5	15	39	2.5
90-DU-2271	2271	200	0.5	2.5	18	15	2.5	–	10	17	2.5	5	0.05	–	–	28	5	17	24	2.5
90-DU-2272	2272	200	0.5	2.5	15	13	2.5	–	10	34	2.5	5	0.12	–	–	38	5	14	26	2.5
90-DU-2276	2276	400	0.5	2.5	25	13	2.5	–	10	33	2.5	5	0.07	–	–	54	5	14	45	2.5
90-DU-2277	2277	400	0.5	2.5	29	16	2.5	–	121	30	2.5	5	0.23	–	–	54	5	17	60	2.5
90-DU-2278	2278	400	1	2.5	278	17	2.5	–	131	21	25	13	0.02	–	–	79	5	14	79	2.5
90-DU-2279	2279	600	2	2.5	86	61	2.5	–	127	21	2.5	5	0.33	–	–	85	5	18	414	21
90-DU-2280	2280	500	0.5	2.5	45	29	2.5	–	10	29	2.5	5	0.29	–	–	68	5	19	111	13
90-DU-2281	2281	600	1	2.5	63	33	2.5	–	10	19	2.5	5	0.3	–	–	84	5	19	122	2.5
90-DU-2285	2285	300	0.5	5	19	13	2.5	–	10	124	2.5	13	0.11	–	–	32	5	23	41	2.5
90-DU-2286	2286	400	2	2.5	29	18	2.5	–	10	41	2.5	5	0.23	–	–	45	5	16	66	2.5
90-DU-2288	2288	400	0.5	6	30	13	2.5	–	10	119	2.5	13	0.2	–	–	45	5	22	69	2.5
90-DU-2290	2290	300	0.5	2.5	21	17	2.5	–	10	11	2.5	5	0.14	–	–	37	5	17	35	2.5

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
90-DU-2292	2292	0.4	4.46	3	–	171	–	2.5	0.66	0.3	19	190	91	8.08	13	–	1.68	99	86	3.53
90-DU-2294	2294	0.3	2.56	15	–	66	–	2.5	1.07	0.3	12	61	88	5.29	5	–	0.57	81	31	1.44
90-DU-2296	2296	0.4	4.22	7	–	159	–	2.5	0.9	0.3	16	78	76	6.55	12	–	1.45	74	53	2.79
90-DU-2302	2302	0.1	3.13	7	–	84	–	2.5	1.01	0.3	14	72	63	4.9	5	–	0.85	51	42	2.19
90-DU-2312	2312	0.3	3.54	13	–	114	–	2.5	1.06	0.3	18	73	86	5.76	5	–	1.03	83	44	2.35
90-DU-2313	2313	0.1	2.13	7	–	39	–	2.5	0.58	0.3	15	44	55	3.7	5	–	0.3	66	22	1.03
90-DU-2314	2314	0.1	3.29	7	–	103	–	2.5	0.84	0.3	17	77	74	5.95	5	–	1.13	89	53	2.49
90-DU-2316	2316	0.1	2.12	3	–	55	–	2.5	0.49	0.3	19	61	87	6.26	5	–	0.44	103	38	1.65
90-DU-2317	2317	0.1	2.83	7	–	88	–	2.5	0.62	0.3	14	70	57	6.4	5	–	0.98	86	65	2.18
90-DU-2318	2318	0.4	2.25	3	–	123	–	2.5	2.49	0.3	9	41	48	3.37	5	–	0.96	80	37	2.37
90-DU-2319	2319	0.1	4.36	3	–	182	–	2.5	2.99	0.3	18	97	52	6.99	12	–	1.36	75	75	3.37
90-DU-2321	2321	0.6	3.45	6	–	139	–	2.5	10	0.3	15	85	33	5.85	5	–	1.63	73	55	3.39
90-DU-2325	2325	0.5	1.95	3	–	105	–	2.5	2.92	0.3	9	44	25	3.06	5	–	0.93	55	38	2.95
90-DU-2326	2326	0.5	3.04	8	–	121	–	2.5	10	0.3	13	75	33	5.13	5	–	1.44	69	57	3.22
90-DU-2327	2327	0.6	2.22	7	–	126	–	2.5	2.55	0.3	10	52	36	3.52	5	–	1.13	52	48	3.21
90-DU-2332	2332	0.3	3.39	3	–	86	–	2.5	0.35	0.3	27	103	93	7.57	10	–	0.64	210	35	2
90-DU-2335	2335	0.5	7.48	9	–	152	–	2.5	0.32	0.3	32	130	105	16	23	–	2.84	236	119	5.19
90-DU-2339	2339	0.9	7.72	3	–	273	–	2.5	0.4	0.3	36	226	113	16	19	–	3.21	155	110	4.53
90-DU-2344	2344	0.7	7.05	3	–	224	–	2.5	0.14	0.3	27	254	145	16	19	–	1.48	73	107	3.78
90-DU-2351	2351	0.3	6.01	6	–	205	–	2.5	0.56	0.3	23	157	95	16	17	–	1.68	164	90	4.77
90-DU-2356	2356	0.3	4.27	13	–	140	–	2.5	0.46	0.3	22	141	52	7.78	13	–	1.3	69	57	2.91
90-DU-2359	2359	0.5	6.48	13	–	185	–	2.5	0.51	0.3	20	80	82	9.54	18	–	1.34	128	102	4.9
90-DU-2364	2364	0.5	6.38	8	–	129	–	2.5	0.37	0.3	29	112	96	16	23	–	1.76	136	94	5.24
90-DU-2368	2368	0.1	8.32	12	–	180	–	2.5	0.36	0.3	26	127	115	16	20	–	3.57	357	136	4
90-DU-2371	2371	0.3	7.65	3	–	183	–	2.5	0.48	0.3	29	146	113	16	18	–	2.63	123	114	4.26
90-DU-2378	2378	0.1	5.92	11	–	117	–	2.5	0.27	0.3	27	98	60	16	15	–	1.04	105	67	2.65
90-DU-2382	2382	0.1	5.3	6	–	246	–	2.5	0.4	0.3	31	151	81	9.58	12	–	1.11	60	53	3.24
90-DU-2392	2392	0.1	6.36	13	–	272	–	2.5	0.32	0.3	32	224	111	16	16	–	2.4	140	79	4.77
90-DU-2396	2396	0.1	3.62	11	–	157	–	2.5	0.9	0.3	22	87	85	6.46	5	–	1.25	61	50	2.72
90-DU-2400	2400	1.1	0.43	3	–	7	–	39	0	0.3	4	665	299	2.47	5	–	4.07	0.5	12	0.31
90-DU-2401	2401	0.1	3.23	11	–	85	–	2.5	0.59	0.3	17	59	64	5.06	5	–	0.72	38	33	1.53
90-DU-2402	2402	0.1	2.12	3	–	64	–	2.5	0.67	0.3	11	45	35	3.78	5	–	0.65	47	27	1.2
90-DU-2403	2403	0.1	1.4	3	–	48	–	2.5	0.8	0.3	10	35	23	2.73	5	–	0.43	35	17	0.91
90-DU-2412	2412	0.1	2.36	15	–	67	–	2.5	0.88	0.3	17	72	50	5.22	5	–	0.68	102	34	1.83
90-DU-2418	2418	0.1	3.44	7	–	142	–	2.5	4.13	0.3	19	94	35	5.99	11	–	1.61	86	55	3.39
90-DU-2419	2419	0.1	2.67	8	–	175	–	2.5	10	0.3	16	75	28	4.82	5	–	1.53	79	60	3.09
90-DU-2419	2419	0.1	2.62	3	–	165	–	2.5	10	0.3	15	77	31	4.74	5	–	1.46	74	58	3.07
90-DU-2422	2422	0.1	2.84	3	–	172	–	2.5	10	0.3	15	63	36	4.93	5	–	1.44	82	57	2.89
90-DU-2424	2424	0.1	3.13	3	–	178	–	2.5	4.32	0.3	17	88	43	5.58	5	–	1.47	68	58	3.1
90-DU-2425	2425	0.1	2.3	3	–	128	–	2.5	1.97	0.3	13	59	29	3.88	5	–	1.12	62	45	2.89
90-DU-2426	2426	0.1	3.31	3	–	203	–	2.5	4.91	0.3	20	111	82	6.19	11	–	1.7	63	66	3.4
90-DU-2427	2427	0.1	1.77	11	–	110	–	2.5	2.49	0.3	11	48	24	2.88	5	–	0.85	47	38	2.85
90-DU-2429	2429	0.1	2.03	6	–	145	–	2.5	2.2	0.3	12	61	32	3.37	5	–	0.98	59	46	2.91
90-DU-2430	2430	0.1	2.24	12	–	132	–	2.5	10	0.3	13	55	39	3.65	5	–	1.02	84	57	3
90-DU-2433	2433	0.1	1.33	8	–	75	–	2.5	3.05	0.3	7	28	23	1.83	5	–	0.52	53	30	1.84
90-DU-2434	2434	0.1	1.96	3	–	103	–	2.5	2.19	0.3	12	40	30	2.81	5	–	0.63	48	41	1.92
90-DU-2435	2435	0.1	2.41	14	–	119	–	2.5	10	0.3	12	51	41	3.29	5	–	0.83	66	49	2.63
90-DU-2440	2440	0.1	2.35	3	–	122	–	2.5	10	0.3	12	58	49	3.45	5	–	0.9	83	48	2.92
90-DU-2448	2448	0.1	3.12	13	–	113	–	2.5	0.44	0.3	16	62	47	6.24	5	–	0.97	104	74	1.98
90-DU-2449	2449	0.1	2.87	3	–	157	–	2.5	10	0.3	15	66	39	4.48	5	–	1.27	83	59	2.65
90-DU-2450	2450	0.1	4.05	5	–	178	–	2.5	1.85	0.3	24	109	56	6.62	11	–	1.61	93	71	3.47
90-DU-2451	2451	0.1	3.96	11	–	161	–	2.5	6.58	0.3	19	99	40	6.11	13	–	1.48	77	62	3.33

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		5	1	5	1	2	5	1	20	1	10	10	0.01	10	10	1	10	1	2	5
90-DU-2292	2292	600	2	2.5	79	29	2.5	–	21	16	2.5	5	0.32	–	–	86	5	22	135	2.5
90-DU-2294	2294	400	2	2.5	40	30	2.5	–	10	18	2.5	5	0.26	–	–	63	5	28	70	2.5
90-DU-2296	2296	600	0.5	2.5	51	26	2.5	–	10	25	2.5	14	0.33	–	–	73	5	20	107	2.5
90-DU-2302	2302	500	0.5	2.5	41	21	2.5	–	10	23	2.5	5	0.22	–	–	57	5	18	76	2.5
90-DU-2312	2312	600	0.5	2.5	54	28	2.5	–	10	23	2.5	12	0.29	–	–	69	5	22	103	5
90-DU-2313	2313	500	1	2.5	24	31	2.5	–	10	12	2.5	5	0.11	–	–	42	5	22	51	2.5
90-DU-2314	2314	600	1	2.5	47	35	2.5	–	10	20	2.5	11	0.27	–	–	66	5	20	98	2.5
90-DU-2316	2316	600	1	2.5	42	34	2.5	–	10	11	2.5	5	0.06	–	–	68	5	28	68	2.5
90-DU-2317	2317	500	3	2.5	40	39	2.5	–	10	13	2.5	5	0.2	–	–	64	5	26	91	2.5
90-DU-2318	2318	400	0.5	5	31	18	2.5	–	10	90	2.5	14	0.2	–	–	43	5	23	69	2.5
90-DU-2319	2319	500	0.5	2.5	60	23	2.5	–	10	29	2.5	5	0.31	–	–	78	5	19	126	2.5
90-DU-2321	2321	500	1	2.5	50	20	2.5	–	10	56	2.5	16	0.32	–	–	77	5	18	98	9
90-DU-2325	2325	400	0.5	5	31	16	2.5	–	10	105	2.5	15	0.17	–	–	43	5	22	62	2.5
90-DU-2326	2326	400	2	2.5	46	16	2.5	–	10	68	2.5	16	0.26	–	–	76	5	21	92	9
90-DU-2327	2327	400	0.5	2.5	34	16	2.5	–	10	94	2.5	13	0.21	–	–	49	5	22	70	6
90-DU-2332	2332	900	2	5	47	41	2.5	–	10	18	2.5	12	0.1	–	–	77	5	26	92	2.5
90-DU-2335	2335	900	1	2.5	81	40	2.5	–	26	22	25	15	0.4	–	–	114	5	22	228	28
90-DU-2339	2339	800	2	2.5	131	46	2.5	–	28	19	10	11	0.45	–	–	132	5	25	226	22
90-DU-2344	2344	700	5	6	111	50	2.5	–	10	8	32	5	0.19	–	–	132	5	20	172	2.5
90-DU-2351	2351	700	3	2.5	96	33	2.5	–	28	14	14	14	0.45	–	–	130	5	28	162	2.5
90-DU-2356	2356	900	1	2.5	73	31	2.5	–	10	20	-10	13	0.16	–	–	78	5	17	124	2.5
90-DU-2359	2359	900	0.5	2.5	63	70	2.5	–	21	8	13	12	0.3	–	–	111	5	35	243	10
90-DU-2364	2364	1000	2	2.5	67	28	2.5	–	25	12	26	17	0.36	–	–	113	5	22	200	2.5
90-DU-2368	2368	1000	3	2.5	77	72	2.5	–	32	21	2.5	5	0.54	–	–	143	5	36	253	17
90-DU-2371	2371	800	2	2.5	85	47	2.5	–	31	19	13	5	0.54	–	–	140	5	27	173	20
90-DU-2378	2378	800	3	2.5	57	34	2.5	–	10	15	22	5	0.36	–	–	112	5	18	175	22
90-DU-2382	2382	900	14	2.5	74	30	2.5	–	10	19	24	5	0.04	–	–	118	5	14	149	2.5
90-DU-2392	2392	800	3	2.5	118	40	2.5	–	10	13	27	5	0.37	–	–	149	5	19	224	16
90-DU-2396	2396	600	0.5	2.5	74	15	2.5	–	10	28	12	5	0.24	–	–	81	5	14	163	5
90-DU-2400	2400	100	9	2.5	6	21	15	–	10	7	2.5	5	0.09	–	–	246	5	3	57	2.5
90-DU-2401	2401	500	1	5	43	17	2.5	–	10	19	-10	5	0.18	–	–	60	5	12	80	2.5
90-DU-2402	2402	400	0.5	2.5	33	12	2.5	–	10	21	2.5	5	0.17	–	–	51	5	13	76	10
90-DU-2403	2403	300	0.5	2.5	25	11	2.5	–	10	21	2.5	5	0.14	–	–	40	5	11	52	2.5
90-DU-2412	2412	600	0.5	2.5	42	25	2.5	–	10	25	-10	5	0.06	–	–	70	5	21	84	2.5
90-DU-2418	2418	500	2	2.5	58	9	2.5	–	10	39	17	5	0.32	–	–	88	5	13	106	12
90-DU-2419	2419	600	2	2.5	50	10	2.5	–	10	81	37	5	0.26	–	–	67	5	12	95	13
90-DU-2419	2419	600	2	2.5	54	11	2.5	–	10	77	39	5	0.25	–	–	66	5	12	94	11
90-DU-2422	2422	600	0.5	2.5	40	11	2.5	–	10	68	42	5	0.27	–	–	67	5	13	97	13
90-DU-2424	2424	500	0.5	2.5	55	9	2.5	–	10	45	23	5	0.3	–	–	78	5	12	105	17
90-DU-2425	2425	400	0.5	7	40	9	2.5	–	10	87	17	5	0.21	–	–	58	5	13	75	8
90-DU-2426	2426	600	0.5	2.5	85	19	2.5	–	10	41	24	5	0.27	–	–	76	5	13	119	2.5
90-DU-2427	2427	400	0.5	7	33	8	2.5	–	10	100	-10	5	0.15	–	–	45	5	12	57	5
90-DU-2429	2429	400	0.5	8	42	9	2.5	–	10	103	22	5	0.19	–	–	56	5	14	71	11
90-DU-2430	2430	500	1	2.5	36	10	2.5	–	10	96	38	5	0.2	–	–	55	5	12	77	8
90-DU-2433	2433	300	2	9	19	5	2.5	–	10	157	12	5	0.1	–	–	33	5	20	45	10
90-DU-2434	2434	400	1	9	29	10	2.5	–	10	130	-10	5	0.14	–	–	43	5	17	61	2.5
90-DU-2435	2435	400	3	2.5	34	14	2.5	–	10	106	46	5	0.19	–	–	51	5	18	75	8
90-DU-2440	2440	500	2	2.5	37	13	2.5	–	10	83	40	5	0.19	–	–	51	5	18	80	9
90-DU-2448	2448	700	2	7	39	48	2.5	–	10	12	2.5	5	0.21	–	–	67	5	23	106	2.5
90-DU-2449	2449	500	0.5	2.5	42	11	2.5	–	10	93	38	5	0.26	–	–	71	5	17	97	12
90-DU-2450	2450	600	0.5	2.5	69	12	2.5	–	10	32	23	5	0.37	–	–	101	5	16	130	16
90-DU-2451	2451	500	0.5	2.5	61	15	2.5	–	10	51	28	5	0.33	–	–	92	5	15	118	2.5

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
90-DU-2454	2454	0.1	4.27	6	–	200	–	2.5	1.23	0.3	25	121	37	7.06	12	–	2.14	96	68	3.98
90-DU-2455	2455	0.1	4.63	7	–	149	–	2.5	0.5	0.3	28	133	56	8.48	13	–	1.67	150	65	3.75
90-DU-2457	2457	0.1	3.78	3	–	162	–	2.5	0.75	0.3	31	127	83	9.22	5	–	1.5	181	64	3.44
90-DU-2458	2458	0.1	3.09	8	–	88	–	2.5	0.34	0.3	22	156	75	16	5	–	0.67	133	48	2.25
90-DU-2460	2460	0.1	3.94	10	–	177	–	2.5	0.47	0.3	24	134	79	7.69	11	–	1.44	125	72	3.18
90-DU-2461	2461	0.1	4.67	12	–	189	–	2.5	0.49	0.3	29	162	99	8.46	13	–	1.7	110	82	3.6
90-DU-2462	2462	0.1	4.48	18	–	104	–	2.5	0.39	0.3	38	133	92	8.5	10	–	0.89	83	76	3.31
90-DU-2465	2465	0.1	4.86	11	–	271	–	2.5	0.52	0.3	36	112	107	9.3	14	–	1.5	307	83	3.86
90-DU-2467	2467	0.1	2.22	3	–	166	–	2.5	0.85	0.3	28	28	36	5.82	5	–	0.57	206	47	1.95
90-DU-2468	2468	0.1	4.66	50	–	192	–	6	0.43	0.3	34	63	79	9.08	22	–	0.77	230	70	2.58
90-DU-2471	2471	0.1	3.23	20	–	115	–	2.5	0.48	0.3	20	36	36	5.35	13	–	0.44	170	49	1.68
90-DU-2477	2477	0.1	4.86	8	–	275	–	2.5	0.2	0.3	29	78	49	16	11	–	1.13	84	67	2.7
90-DU-2478	2478	0.2	5.95	25	–	755	–	2.5	0.17	0.3	39	73	124	16	16	–	0.93	74	48	2.94
90-DU-2481	2481	0.5	5.2	41	–	809	–	7	0.41	0.3	49	151	104	9.56	19	–	1.75	60	49	4.79
90-DU-2483	2483	0.5	4.47	33	–	138	–	6	0.13	0.3	42	62	86	16	15	–	0.38	63	40	1.63
90-DU-2486	2486	0.7	3.36	3	–	30	–	26	0	0.3	7	117	222	2.33	14	–	1.53	10	32	1.34
90-DU-2486	2486	0.1	4.83	3	–	307	–	2.5	0.25	0.3	26	98	110	8.43	5	–	1.05	69	52	2.6
90-DU-2488	2488	0.1	4	5	–	329	–	2.5	0.95	0.3	22	76	86	6.95	10	–	1.31	124	59	3.04
90-DU-2493	2493	0.1	4.52	8	–	115	–	2.5	0.3	0.3	28	87	80	6.86	5	–	0.71	118	55	2.54
90-DU-2494	2494	0.1	5.77	21	–	219	–	2.5	0.89	0.3	25	120	127	8.39	15	–	1.93	84	86	4.17
90-DU-2495	2495	0.1	5.2	28	–	183	–	2.5	0.72	0.3	28	94	127	8.48	12	–	1.23	121	96	3.32
90-DU-2496	2496	0.3	5.44	207	–	139	–	2.5	2.37	0.3	31	111	217	16	12	–	1.36	82	129	3.64
90-DU-2499	2499	0.1	7.47	10	–	138	–	2.5	0.21	0.3	21	68	49	6.43	13	–	0.57	116	61	1.89
90-DU-2500	2500	0.1	6	10	–	155	–	2.5	0.25	0.3	22	53	36	6.71	12	–	0.85	103	80	1.95
90-DU-2501	2501	0.1	5.98	11	–	208	–	2.5	0.21	0.3	29	105	58	9.5	14	–	0.82	108	69	2.68
90-DU-2503	2503	0.1	3.61	10	–	216	–	2.5	0.33	0.3	31	317	38	6.91	5	–	0.88	36	39	3.15
90-DU-2504	2504	0.1	5.66	11	–	131	–	2.5	0.09	0.3	22	46	43	16	12	–	0.61	269	53	1.79
90-DU-2505	2505	0.1	4.7	8	–	279	–	2.5	0.37	0.3	32	78	70	16	12	–	1.07	543	69	2.55
90-DU-2508	2508	0.1	5.16	6	–	299	–	2.5	0.37	0.3	38	164	104	9.66	14	–	1.68	157	86	4.06
90-DU-2510	2510	0.1	4.52	6	–	109	–	2.5	0.17	0.3	28	121	74	7.61	5	–	0.73	104	57	2.32
90-DU-2513	2513	0.1	5.49	15	–	207	–	2.5	0.53	0.3	26	155	98	8.29	14	–	1.87	104	62	3.94
90-DU-2514	2514	0.1	5.7	13	–	226	–	2.5	0.66	0.3	25	147	95	8.08	15	–	2.04	85	62	4.18
90-DU-2517	2517	0.1	4.21	15	–	112	–	2.5	0.43	0.3	22	98	61	6.04	10	–	1.15	90	52	2.92
90-DU-2520	2520	0.1	5.71	8	–	169	–	2.5	0.28	0.3	37	194	95	16	14	–	1.26	93	63	3.75
90-DU-2528	2528	0.1	4.02	7	–	230	–	2.5	0.34	0.3	62	23	165	8.28	5	–	0.65	228	48	1.84
90-DU-2530	2530	0.1	5.33	12	–	149	–	2.5	0.33	0.3	21	83	44	6.31	11	–	0.72	133	46	2.46
90-DU-2531	2531	0.1	4.65	12	–	150	–	2.5	0.48	0.3	26	133	69	8.02	11	–	1.6	67	50	3.4
90-DU-2536	2536	0.1	3.33	7	–	133	–	2.5	0.57	0.3	27	106	68	6.75	5	–	0.84	116	46	2.51
90-DU-2538	2538	0.1	5.11	13	–	151	–	2.5	0.34	0.3	27	147	95	9.41	14	–	1.51	146	80	3.95
90-DU-2540	2540	0.1	6.26	7	–	81	–	2.5	0.22	0.3	32	89	143	16	21	–	0.28	588	70	6.08
90-DU-2541	2541	0.1	5.31	12	–	161	–	2.5	0.29	0.3	24	148	76	9.62	12	–	1.48	102	77	3.73
90-DU-2542	2542	0.1	5.55	9	–	390	–	2.5	0.74	0.3	22	119	108	8.1	16	–	1.14	152	77	4.9
90-DU-2543	2543	0.1	4.67	9	–	203	–	2.5	0.44	0.3	24	121	61	7.94	14	–	1.63	93	94	4.36
90-DU-2544	2544	0.1	4.89	11	–	190	–	2.5	0.51	0.3	25	123	65	7.88	12	–	1.78	76	70	4.03
90-DU-2545	2545	0.1	4.85	13	–	125	–	2.5	0.34	0.3	26	168	78	8.76	13	–	1.29	86	69	3.62
90-DU-2546	2546	0.1	3.81	12	–	142	–	2.5	0.63	0.3	26	139	77	7.06	11	–	1.55	130	56	3.64
90-DU-2548	2548	0.1	5.09	15	–	201	–	2.5	0.4	0.3	24	125	105	8.02	13	–	2.1	102	63	3.75
90-DU-2551	2551	0.1	5.13	13	–	194	–	2.5	0.47	0.3	26	138	96	8.07	14	–	2.06	110	64	3.99
90-DU-2554	2554	0.1	3.83	3	–	68	–	2.5	0.13	0.3	11	32	18	4.6	5	–	0.37	39	47	1.27
90-DU-2555	2555	0.1	2.41	3	–	67	–	2.5	0.31	0.3	15	50	66	4.5	5	–	0.38	51	61	1.55
90-DU-2559	2559	0.1	2.11	6	–	152	–	2.5	0.75	0.3	18	63	42	6.06	5	–	0.8	152	45	1.95
90-DU-2561	2561	0.2	1.54	3	–	48	–	2.5	0.43	0.3	10	73	28	2.51	5	–	0.31	48	15	0.76

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		5	1	5	1	2	5	1	20	1	10	10	0.01	10	10	1	10	1	2	5
90-DU-2454	2454	700	1	2.5	76	8	2.5	–	10	31	19	5	0.45	–	–	107	5	18	138	2.5
90-DU-2455	2455	600	2	2.5	80	17	2.5	–	20	18	19	5	0.41	–	–	119	5	18	137	2.5
90-DU-2457	2457	800	3	2.5	88	21	2.5	–	10	20	2.5	5	0.02	–	–	125	5	27	141	2.5
90-DU-2458	2458	600	4	6	72	21	2.5	–	10	10	13	5	0.03	–	–	164	5	23	93	2.5
90-DU-2460	2460	700	0.5	2.5	87	25	2.5	–	10	20	2.5	5	0.36	–	–	108	5	20	139	2.5
90-DU-2461	2461	800	1	5	104	24	2.5	–	22	18	13	5	0.44	–	–	117	5	20	157	2.5
90-DU-2462	2462	700	2	2.5	83	27	2.5	–	10	14	20	5	0.17	–	–	155	5	19	131	2.5
90-DU-2465	2465	800	2	2.5	83	24	2.5	–	21	25	26	5	0.44	–	–	130	5	35	213	2.5
90-DU-2467	2467	900	2	2.5	23	13	2.5	–	10	41	2.5	5	0.12	–	–	85	5	29	125	2.5
90-DU-2468	2468	800	5	7	46	37	11	–	21	22	21	19	0.15	–	–	132	5	30	171	2.5
90-DU-2471	2471	700	2	2.5	27	22	2.5	–	10	17	12	5	0.16	–	–	70	5	24	117	2.5
90-DU-2477	2477	700	2	2.5	41	24	2.5	–	10	15	18	5	0.26	–	–	173	5	10	202	2.5
90-DU-2478	2478	600	3	6	51	18	2.5	–	22	17	18	5	0.35	–	–	207	5	11	175	2.5
90-DU-2481	2481	900	4	6	115	24	11	–	24	25	30	14	0.3	–	–	147	5	13	191	2.5
90-DU-2483	2483	2000	4	6	46	31	2.5	–	10	7	18	10	0.08	–	–	94	5	13	165	2.5
90-DU-2486	2486	100	117	2.5	20	100	5	–	10	13	2.5	5	0.17	–	–	444	5	6	159	2.5
90-DU-2486	2486	400	17	2.5	67	38	2.5	–	10	14	20	5	0.13	–	–	110	5	13	164	2.5
90-DU-2488	2488	500	0.5	5	60	17	2.5	–	10	48	17	5	0.35	–	–	94	5	19	145	2.5
90-DU-2493	2493	700	2	6	67	22	2.5	–	10	10	15	5	0.2	–	–	87	5	17	148	2.5
90-DU-2494	2494	500	5	5	117	22	2.5	–	23	23	33	5	0.41	–	–	148	5	19	192	19
90-DU-2495	2495	700	1	6	109	29	2.5	–	10	20	31	5	0.26	–	–	119	5	31	246	2.5
90-DU-2496	2496	700	5	2.5	180	38	2.5	–	21	48	29	5	0.26	–	–	148	5	32	428	21
90-DU-2499	2499	900	1	2.5	47	29	2.5	–	10	13	24	5	0.22	–	–	87	5	22	129	2.5
90-DU-2500	2500	900	1	5	39	38	2.5	–	10	14	17	5	0.13	–	–	76	5	27	161	2.5
90-DU-2501	2501	600	2	2.5	61	29	2.5	–	22	14	20	5	0.32	–	–	173	5	15	158	2.5
90-DU-2503	2503	600	2	2.5	182	17	6	–	10	15	24	5	0.24	–	–	96	5	7	127	2.5
90-DU-2504	2504	800	2	6	26	37	2.5	–	20	14	18	5	0.29	–	–	169	5	24	150	2.5
90-DU-2505	2505	1700	2	2.5	49	43	2.5	–	10	38	24	5	0.06	–	–	134	5	63	198	2.5
90-DU-2508	2508	900	2	5	126	26	2.5	–	21	16	35	5	0.43	–	–	140	5	19	193	2.5
90-DU-2510	2510	600	3	8	77	44	2.5	–	10	9	22	5	0.23	–	–	109	5	16	155	2.5
90-DU-2513	2513	700	0.5	2.5	108	28	2.5	–	24	19	35	5	0.45	–	–	118	5	18	192	18
90-DU-2514	2514	600	0.5	2.5	98	22	2.5	–	23	17	40	5	0.48	–	–	136	5	18	129	6
90-DU-2517	2517	400	1	5	57	24	2.5	–	10	14	26	5	0.16	–	–	94	5	16	87	2.5
90-DU-2520	2520	1100	3	2.5	122	29	2.5	–	24	12	41	5	0.38	–	–	160	5	14	165	2.5
90-DU-2528	2528	1400	1	2.5	31	24	2.5	–	10	16	24	5	0.08	–	–	120	5	19	114	2.5
90-DU-2530	2530	800	0.5	2.5	60	21	2.5	–	10	15	19	5	0.08	–	–	86	5	23	111	2.5
90-DU-2531	2531	600	0.5	2.5	77	20	2.5	–	10	13	34	5	0.31	–	–	117	5	14	108	2.5
90-DU-2536	2536	800	1	2.5	65	19	2.5	–	10	17	19	5	0.09	–	–	90	5	18	102	2.5
90-DU-2538	2538	800	4	2.5	90	28	2.5	–	20	12	32	5	0.41	–	–	128	5	22	154	2.5
90-DU-2540	2540	1500	1	2.5	51	4	2.5	–	10	14	52	5	0.09	–	–	215	5	69	180	11
90-DU-2541	2541	700	3	2.5	84	24	2.5	–	25	11	39	5	0.44	–	–	134	5	19	152	14
90-DU-2542	2542	600	1	5	77	53	2.5	–	23	11	42	5	0.35	–	–	121	5	34	185	13
90-DU-2543	2543	700	0.5	5	78	36	2.5	–	22	10	32	5	0.41	–	–	104	5	16	160	2.5
90-DU-2544	2544	700	1	6	75	25	2.5	–	22	14	44	5	0.41	–	–	115	5	15	125	2.5
90-DU-2545	2545	700	2	2.5	109	21	2.5	–	10	11	30	5	0.29	–	–	131	5	15	134	2.5
90-DU-2546	2546	700	0.5	2.5	80	22	2.5	–	10	18	24	5	0.11	–	–	101	5	16	115	2.5
90-DU-2548	2548	600	0.5	2.5	83	18	2.5	–	22	15	32	5	0.46	–	–	111	5	15	155	14
90-DU-2551	2551	600	0.5	2.5	92	20	2.5	–	20	17	38	5	0.44	–	–	117	5	17	150	2.5
90-DU-2554	2554	400	0.5	7	18	13	2.5	–	10	7	14	5	0.12	–	–	46	5	10	97	2.5
90-DU-2555	2555	400	2	2.5	29	34	2.5	–	10	16	17	5	0.07	–	–	55	5	9	87	2.5
90-DU-2559	2559	600	0.5	2.5	40	15	2.5	–	10	22	14	5	0.13	–	–	85	5	25	111	2.5
90-DU-2561	2561	400	0.5	2.5	31	13	2.5	–	61	13	2.5	5	0.07	–	–	34	5	12	36	2.5

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
90-DU-2562	2562	0.1	4.26	11	–	144	–	2.5	0.51	0.3	25	146	82	7.55	14	–	1.74	128	72	3.41
90-DU-2564	2564	0.1	3.49	8	–	84	–	2.5	0.56	0.3	20	92	74	6.75	12	–	1.14	121	58	2.73
90-DU-2567	2567	0.1	2.23	6	–	73	–	2.5	0.8	0.3	15	62	59	4.55	5	–	0.65	115	31	1.63
90-DU-2571	2571	0.4	0.76	3	–	25	–	2.5	0.6	0.3	6	46	13	1.75	5	–	0.14	30	6	0.46
90-DU-2573	2573	0.1	0.97	3	–	31	–	2.5	0.72	0.3	7	73	21	2.49	5	–	0.19	44	10	0.61
90-DU-2577	2577	0.1	1.87	7	–	140	–	2.5	1.01	0.3	14	77	38	4.94	5	–	0.58	109	35	1.63
90-DU-2587	2587	0.1	3.32	12	–	217	–	2.5	0.33	0.3	14	54	58	5.17	11	–	0.39	62	58	9.13
90-DU-2588	2588	0.1	4.46	6	–	157	–	2.5	0.37	0.3	33	234	93	8.61	14	–	1.36	197	71	3.91
90-DU-2590	2590	0.1	4.37	17	–	161	–	2.5	0.43	0.3	28	121	76	7.96	13	–	1.15	133	64	3.31
90-DU-2591	2591	0.1	4.69	11	–	155	–	2.5	0.56	0.3	27	124	87	9.19	15	–	1.74	218	87	4.2
90-DU-2592	2592	0.1	4.44	12	–	110	–	2.5	0.21	0.3	25	108	75	8.25	13	–	0.78	117	66	3.1
90-DU-2595	2595	0.1	6.08	11	–	246	–	2.5	0.32	0.3	28	175	92	9.36	18	–	1.74	159	100	5.12
90-DU-2596	2596	0.1	6.55	13	–	151	–	2.5	0.16	0.3	21	142	70	9.25	16	–	1.82	57	82	4.9
90-DU-2598	2598	0.1	3.67	6	–	226	–	2.5	4.76	0.3	19	89	63	6.4	10	–	1.14	116	74	2.91
90-DU-2600	2600	0.1	4.64	10	–	265	–	2.5	0.45	0.3	24	80	73	8.3	13	–	1.27	98	81	3.38
90-DU-2601	2601	0.1	3.37	3	–	221	–	2.5	0.39	0.3	25	33	35	6.49	5	–	0.75	112	47	1.69
90-DU-2602	2602	0.1	4.66	9	–	381	–	2.5	0.27	0.3	29	51	76	9.12	10	–	1.22	129	65	2.75
90-DU-2606	2606	0.1	2.21	3	–	152	–	2.5	2.04	0.3	13	49	45	3.54	5	–	0.78	44	48	2.06
90-DU-2607	2607	0.1	2.18	8	–	172	–	2.5	10	0.3	14	44	27	3.46	5	–	0.68	39	49	2.22
90-DU-2608	2608	0.5	4.69	10	–	297	–	2.5	0.34	0.3	79	80	532	16	5	–	0.7	31	41	2.91
90-DU-2610	2610	0.1	3.67	9	–	162	–	2.5	0.19	0.3	43	71	87	6.94	5	–	0.31	85	23	1.35
90-DU-2611	2611	0.1	3.54	10	–	478	–	2.5	0.76	0.3	31	77	121	8.36	5	–	1.29	131	66	3.03
90-DU-2615	2615	0.1	1.98	8	–	141	–	2.5	2.01	0.3	11	46	29	3.25	5	–	0.76	47	37	2.09
90-DU-2616	2616	0.1	1.56	106	–	2.5	5	0.63	2.25	0.3	8	39	16	2.57	38	–	2.09	2.5	6	–
91-DU-3001	3001	0.1	6.38	3	0.5	230	0.3	1	0.44	0.3	30	169	143	8.42	5	0.5	2.31	40	–	3.41
91-DU-3002	3002	0.1	6.03	3	–	230	0.3	1	0.37	0.5	28	180	97	8.52	5	0.5	2.46	60	–	3.21
91-DU-3003	3003	0.1	4.54	3	0.5	80	0.3	1	0.36	0.3	26	99	50	6.98	5	0.5	0.57	100	–	1.87
91-DU-3004	3004	0.1	6.9	14	2	150	1.5	1	0.23	0.3	31	163	50	6.38	5	0.5	2.31	40	–	4.42
91-DU-3005	3005	0.1	5.56	336	0.5	150	0.3	1	0.26	0.5	35	151	164	7.77	5	0.5	2.5	50	–	3.3
91-DU-3007	3007	0.1	3.53	3	2	170	0.3	1	1.23	0.3	14	105	31	5.19	5	0.5	1.23	60	–	2.49
91-DU-3008	3008	0.1	5.64	3	0.5	430	0.3	1	0.98	1	29	135	143	9.6	5	0.5	1.75	250	–	2.82
91-DU-3010	3010	0.1	5.53	16	–	230	0.3	1	0.48	1	37	161	165	8.14	5	0.5	1.78	80	–	3.58
91-DU-3011	3011	0.1	6.42	3	0.5	280	0.3	1	0.5	0.3	27	151	82	9.17	5	0.5	2.53	160	–	4.02
91-DU-3013	3013	0.1	5.18	3	0.5	230	0.3	1	0.31	0.3	29	81	92	9.98	5	0.5	0.97	260	–	2.47
91-DU-3015	3015	0.1	4.55	3	0.5	190	0.3	1	0.39	0.3	23	143	76	7.1	5	0.5	2.07	110	–	2.84
91-DU-3017	3017	0.1	5.15	3	0.5	320	0.3	1	2	0.5	25	137	126	7.68	5	0.5	2.02	80	–	3.58
91-DU-3018	3018	0.1	5.75	3	0.5	160	0.3	1	0.31	0.3	29	128	91	8.99	5	0.5	1.93	130	–	3.37
91-DU-3019	3019	0.1	6.36	3	8	390	0.3	1	0.37	0.3	32	223	152	10.2	5	0.5	2.52	200	–	3.9
91-DU-3020	3020	0.1	6.39	3	0.5	320	0.3	1	0.33	0.3	33	204	115	9.91	5	0.5	2.73	170	–	3.74
91-DU-3021	3021	0.1	3.37	3	0.5	130	0.3	1	0.45	0.3	23	113	66	6.26	5	0.5	1.12	130	–	2.04
91-DU-3022	3022	0.1	5.03	6	1	230	0.3	1	1.04	0.5	23	129	97	7.26	5	0.5	1.79	140	–	3.66
91-DU-3023	3023	0.1	5.5	8	0.5	270	0.3	1	1.1	0.5	26	126	80	7.1	5	0.5	1.66	90	–	3.48
91-DU-3024	3024	0.1	6.02	20	2	280	0.3	1	0.61	1.5	33	158	189	8.12	5	0.5	1.99	80	–	3.49
91-DU-3025	3025	0.1	5.64	3	3	320	0.3	1	0.38	0.5	27	136	100	8.2	5	0.5	2.34	110	–	3.89
91-DU-3028	3028	0.1	3.11	3	–	70	0.3	1	0.14	0.3	24	95	50	4.73	5	0.5	0.51	70	–	1.27
91-DU-3029	3029	0.1	6.87	14	8	280	0.3	1	0.29	1	27	200	131	9.05	5	0.5	2.88	40	–	3.47
91-DU-3030	3030	0.1	6.66	3	0.5	280	0.3	1	0.44	0.3	27	201	101	8.58	5	0.5	2.92	60	–	3.78
91-DU-3035	3035	0.1	6.63	3	0.5	170	0.5	1	0.27	0.3	27	184	75	7.8	5	0.5	2.22	70	–	3.96
91-DU-3036	3036	0.1	3.77	3	–	30	0.3	1	0.26	0.3	17	264	14	3.85	5	0.5	0.13	120	–	3.12
91-DU-3039	3039	0.1	7.64	4	0.5	150	1	1	0.48	1	30	164	85	7.27	5	0.5	2.34	60	–	3.7
91-DU-3043	3043	0.1	7.17	3	0.5	120	1	1	0.75	0.5	27	124	35	5.09	5	0.5	1.99	70	–	2.9
91-DU-3044	3044	0.1	7.58	18	3	250	8.5	1	0.19	0.5	25	125	75	7.16	5	0.5	1.94	110	–	2.28

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		5	1	5	1	2	5	1	20	1	10	10	0.01	10	10	1	10	1	2	5
90-DU-2562	2562	800	1	2.5	73	24	2.5	–	10	19	28	5	0.27	–	–	98	5	17	161	2.5
90-DU-2564	2564	700	0.5	2.5	52	22	2.5	–	10	16	24	5	0.27	–	–	88	5	19	141	11
90-DU-2567	2567	600	1	2.5	37	26	2.5	–	10	23	13	5	0.15	–	–	60	5	19	85	2.5
90-DU-2571	2571	200	0.5	2.5	19	8	2.5	–	10	21	12	5	0.09	–	–	25	5	9	19	2.5
90-DU-2573	2573	200	0.5	2.5	28	14	2.5	–	10	24	2.5	5	0.09	–	–	35	5	13	28	2.5
90-DU-2577	2577	600	1	2.5	40	21	2.5	–	10	37	2.5	5	0.06	–	–	65	5	22	76	2.5
90-DU-2587	2587	600	1	2.5	39	44	2.5	–	10	6	59	5	0.1	–	–	70	5	24	84	2.5
90-DU-2588	2588	900	1	2.5	158	30	2.5	–	10	15	32	5	0.09	–	–	108	5	21	151	2.5
90-DU-2590	2590	700	2	2.5	76	27	2.5	–	10	14	33	5	0.2	–	–	108	5	28	124	2.5
90-DU-2591	2591	800	3	2.5	79	30	2.5	–	20	17	35	5	0.41	–	–	117	5	31	160	2.5
90-DU-2592	2592	700	17	2.5	68	36	2.5	–	10	11	29	5	0.19	–	–	111	5	22	144	2.5
90-DU-2595	2595	800	0.5	2.5	131	36	2.5	–	24	11	52	5	0.41	–	–	121	5	28	195	6
90-DU-2596	2596	500	4	5	79	33	2.5	–	22	7	41	5	0.39	–	–	141	5	14	162	2.5
90-DU-2598	2598	500	2	2.5	59	20	2.5	–	10	60	23	5	0.26	–	–	99	5	18	132	6
90-DU-2600	2600	700	1	2.5	58	22	2.5	–	10	18	16	5	0.35	–	–	108	5	13	179	2.5
90-DU-2601	2601	800	2	2.5	20	21	2.5	–	10	18	5	5	0.08	–	–	80	5	12	127	2.5
90-DU-2602	2602	700	3	2.5	39	22	2.5	–	10	16	11	5	0.2	–	–	122	5	14	185	2.5
90-DU-2606	2606	300	0.5	7	38	12	2.5	–	10	103	2.5	5	0.18	–	–	63	5	13	84	6
90-DU-2607	2607	300	0.5	2.5	33	12	2.5	–	10	93	32	5	0.16	–	–	57	5	8	74	2.5
90-DU-2608	2608	1800	2	2.5	191	14	2.5	–	10	12	18	5	0.2	–	–	116	5	11	229	2.5
90-DU-2610	2610	1300	2	2.5	61	25	2.5	–	10	41	2.5	5	0.04	–	–	71	5	17	134	2.5
90-DU-2611	2611	1000	1	2.5	65	22	2.5	–	10	26	13	5	0.02	–	–	114	5	20	156	2.5
90-DU-2615	2615	300	0.5	7	28	9	2.5	–	10	110	5	5	0.16	–	–	49	5	12	79	6
90-DU-2616	2616	300	0.5	5	23	7	109	0.14	5	–	–	–	44	31	–	12	5	7	63	10
90-DU-3001	3001	600	2	–	106	28	1	23	–	15	–	–	0.39	5	5	162	5	–	198	–
90-DU-3002	3002	665	3	–	112	42	1	24	–	14	–	–	0.42	5	5	159	5	–	256	–
90-DU-3003	3003	1400	2	–	41	50	1	11	–	17	–	–	0.21	30	5	122	5	–	140	–
90-DU-3004	3004	380	8	–	110	22	4	22	–	8	–	–	0.29	5	5	136	5	–	68	–
90-DU-3005	3005	550	2	–	124	26	2	22	–	8	–	–	0.39	5	5	140	5	–	116	–
90-DU-3007	3007	395	1	–	43	24	1	12	–	24	–	–	0.2	5	5	105	5	–	130	–
90-DU-3008	3008	680	3	–	99	40	1	21	–	25	–	–	0.21	40	5	157	5	–	352	–
90-DU-3010	3010	940	2	–	147	36	2	20	–	11	–	–	0.27	10	5	169	5	–	354	–
90-DU-3011	3011	1100	0.5	–	59	44	6	22	–	13	–	–	0.34	30	5	132	5	–	234	–
90-DU-3013	3013	1435	2	–	41	88	2	18	–	20	–	–	0.05	80	5	140	5	–	226	–
90-DU-3015	3015	780	4	–	79	40	2	19	–	11	–	–	0.27	10	5	147	5	–	212	–
90-DU-3017	3017	730	0.5	–	100	42	1	20	–	24	–	–	0.3	5	5	141	5	–	298	–
90-DU-3018	3018	1185	3	–	64	44	2	22	–	13	–	–	0.26	30	5	146	5	–	268	–
90-DU-3019	3019	905	0.5	–	99	34	2	22	–	18	–	–	0.31	40	5	157	5	–	264	–
90-DU-3020	3020	1095	0.5	–	76	46	4	22	–	19	–	–	0.19	40	5	163	5	–	244	–
90-DU-3021	3021	895	1	–	45	36	2	13	–	21	–	–	0.11	20	5	104	5	–	136	–
90-DU-3022	3022	745	0.5	–	85	50	4	18	–	16	–	–	0.29	10	5	130	5	–	300	–
90-DU-3023	3023	825	0.5	–	83	52	2	19	–	14	–	–	0.29	5	5	126	5	–	266	–
90-DU-3024	3024	805	0.5	–	182	42	1	23	–	11	–	–	0.18	10	5	162	5	–	446	–
90-DU-3025	3025	955	0.5	–	77	36	4	21	–	11	–	–	0.27	20	5	128	5	–	288	–
90-DU-3028	3028	1415	2	–	35	60	2	8	–	8	–	–	0.21	5	5	85	5	–	86	–
90-DU-3029	3029	675	3	–	139	44	4	27	–	11	–	–	0.41	5	5	180	5	–	342	–
90-DU-3030	3030	715	1	–	100	44	6	28	–	12	–	–	0.44	5	5	175	5	–	220	–
90-DU-3035	3035	670	1	–	98	26	1	24	–	11	–	–	0.32	10	5	145	5	–	152	–
90-DU-3036	3036	630	1	–	74	12	2	9	–	16	–	–	0.07	20	5	53	5	–	100	–
90-DU-3039	3039	630	6	–	182	28	2	25	–	12	–	–	0.3	5	5	150	5	–	462	–
90-DU-3043	3043	620	3	–	89	40	8	17	–	12	–	–	0.28	5	5	113	5	–	74	–
90-DU-3044	3044	640	0.5	–	88	56	1	23	–	12	–	–	0.26	30	5	119	5	–	256	–

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
91-DU-3045	3045	0.1	6.6	3	1	230	0.5	1	0.42	0.3	23	164	91	7.82	5	0.5	2.4	70	–	3.03
91-DU-3046	3046	0.1	6.3	14	0.5	210	0.3	1	0.43	0.5	24	157	77	7.57	5	0.5	2.04	110	–	3.02
91-DU-3049	3049	0.1	6.12	6	1	190	0.5	1	0.48	0.5	21	154	104	8.2	5	0.5	1.95	70	–	2.88
91-DU-3050	3050	0.1	6.49	3	0.5	150	0.3	1	0.26	0.3	32	141	81	7.84	5	0.5	1.59	70	–	2.41
91-DU-3050	3050	0.1	5.01	6	0.5	90	0.3	1	0.03	0.3	16	122	325	16	5	0.5	1.15	10	–	1.57
91-DU-3054	3054	0.1	6.71	3	2	150	0.3	1	0.1	0.3	22	118	89	7.6	5	0.5	1.23	60	–	1.92
91-DU-3055	3055	0.1	6.55	3	1	250	0.3	1	0.55	0.3	26	157	118	9.72	5	0.5	2.13	100	–	2.62
91-DU-3056	3056	0.1	5.98	32	9	160	0.3	1	0.36	0.3	25	153	96	8.09	5	0.5	1.49	60	–	2.67
91-DU-3057	3057	0.1	6.75	8	13	150	1	1	0.59	0.5	29	164	59	7.26	5	0.5	1.93	100	–	3.35
91-DU-3058	3058	0.1	6.2	3	0.5	340	1	1	0.53	1	27	131	116	7.92	5	0.5	2.13	90	–	3.11
91-DU-3063	3063	0.1	6.2	3	0.5	280	1	1	0.38	0.3	20	146	93	8.04	5	0.5	2.66	90	–	2.78
91-DU-3064	3064	0.1	5.75	3	0.5	100	3	1	0.24	0.3	20	88	48	6.19	5	0.5	0.99	80	–	1.67
91-DU-3064	3064	0.1	3.79	3	–	260	0.3	1	0.1	0.3	41	159	127	13.98	5	0.5	2.11	20	–	1.67
91-DU-3065	3065	0.1	6.17	3	3	250	0.3	1	0.48	0.3	24	134	246	7.35	5	0.5	2.5	110	–	3.28
91-DU-3067	3067	0.1	5.83	3	1	220	0.3	1	0.31	0.3	22	150	58	7.25	5	0.5	2.65	100	–	2.99
91-DU-3068	3068	0.1	5.77	4	0.5	160	0.3	1	0.37	0.3	18	128	71	7.37	5	0.5	1.78	100	–	2.7
91-DU-3071	3071	0.1	4.46	3	0.5	230	0.3	1	0.27	0.5	29	106	80	8.02	5	0.5	1.5	170	–	1.9
91-DU-3078	3078	0.1	5.43	3	0.5	240	0.3	1	0.27	0.5	18	85	83	6.53	5	0.5	1.02	70	–	1.72
91-DU-3080	3080	0.1	6.24	20	0.5	150	0.3	1	0.3	0.5	19	114	82	6.75	5	0.5	1.18	70	–	2.78
91-DU-3082	3082	0.1	6.55	28	14	130	0.3	1	0.52	0.5	22	120	110	7.05	5	0.5	1.02	90	–	3.72
91-DU-3086	3086	0.1	6.02	14	6	230	0.3	1	0.67	1.5	26	147	159	10.01	5	0.5	1.78	160	–	3.16
91-DU-3090	3090	0.1	5.58	10	2	180	0.3	1	0.57	0.5	23	121	142	8.43	5	0.5	1.36	130	–	2.73
91-DU-3093	3093	0.1	4.26	20	2	140	0.3	1	5.04	0.5	20	97	69	4.98	5	0.5	0.91	30	–	3.11
91-DU-3093	3093	0.1	0.82	520	43	60	0.3	12	0.11	0.3	42	29	712	16	5	0.5	0.62	10	–	0.37
91-DU-3095	3095	0.1	5.84	3	0.5	230	0.3	1	0.36	1	31	139	74	8.06	5	0.5	1.63	120	–	3.06
91-DU-3096	3096	0.1	6.1	3	1	210	0.3	1	0.4	1.5	27	155	135	9.41	5	0.5	1.62	70	–	2.92
91-DU-3097	3097	0.1	5.26	122	2	180	13	1	1.27	1.5	27	98	105	7.81	5	0.5	0.75	100	–	2.64
91-DU-3097	3097	2.6	2.51	3	105	10	0.3	42	0.26	0.3	9	40	599	16	5	0.5	0.09	5	–	0.18
91-DU-3097	3097	1.2	3.02	6	–	100	0.3	1	0.01	0.3	3	63	77	7.58	5	0.5	0.61	10	–	0.57
91-DU-3102	3102	0.4	5.73	3	11	340	0.3	1	3.12	0.5	21	127	106	7.11	5	0.5	2.02	90	–	4.16
91-DU-3103	3103	0.1	5.77	3	0.5	220	0.3	1	0.48	0.3	26	156	114	8.24	5	0.5	1.92	100	–	2.9
91-DU-3104	3104	0.1	6.07	3	0.5	250	0.3	1	0.66	0.3	31	165	142	8.69	5	0.5	2.11	160	–	3.37
91-DU-3109	3109	0.2	5.31	3	0.5	120	0.3	1	0.18	0.3	23	121	66	6.47	5	0.5	0.75	80	–	1.82
91-DU-3114	3114	0.1	4.48	3	0.5	130	0.3	1	0.51	0.3	34	210	135	7.53	5	0.5	0.99	240	–	3.05
91-DU-3115	3115	0.1	3.27	3	0.5	60	0.3	1	0.61	0.3	17	170	58	5	5	0.5	0.4	240	–	1.53
91-DU-3117	3117	0.4	5.68	3	0.5	220	0.3	1	0.28	0.3	29	166	65	7.96	5	0.5	1.17	70	–	2.42
91-DU-3123	3123	0.4	6.21	3	0.5	50	0.3	1	0.2	0.3	40	152	449	5.76	5	0.5	0.37	120	–	1.1
91-DU-3130	3130	0.1	5.03	3	–	80	0.3	1	0.16	0.3	12	177	83	4.69	5	0.5	0.52	140	–	0.58
91-DU-3131	3131	0.1	6.22	3	0.5	260	0.3	1	0.54	0.3	43	155	117	9.08	5	0.5	1.09	180	–	3.41
91-DU-3133	3133	0.1	6.39	3	0.5	780	0.3	1	0.28	0.3	39	372	218	8.43	5	0.5	1.54	90	–	3.67
91-DU-3138	3138	0.1	3.86	3	0.5	270	0.3	1	0.35	0.3	21	107	27	5.23	5	0.5	1.3	110	–	2.48
91-DU-3141	3141	0.1	3.92	3	0.5	90	0.3	1	0.27	0.3	19	97	44	5.47	5	0.5	0.73	180	–	1.6
91-DU-3142	3142	0.1	3.29	3	5	70	0.3	1	0.36	0.3	15	78	32	4.45	5	0.5	0.56	90	–	1.4
91-DU-3145	3145	0.1	4.99	3	0.5	200	0.3	1	0.37	0.3	30	146	97	7.66	5	0.5	1.73	90	–	2.87
91-DU-3146	3146	0.1	6.41	3	3	180	0.3	1	0.67	0.5	26	183	85	9.18	5	0.5	2.08	140	–	3.13
91-DU-3147	3147	0.4	7.43	6	0.5	230	0.3	1	0.45	0.3	27	212	110	9.24	5	0.5	2.96	80	–	3.6
91-DU-3149	3149	0.1	6.69	3	0.5	230	0.3	1	0.76	0.3	28	174	103	9.03	5	0.5	1.68	140	–	3.73
91-DU-3152	3152	0.2	6.44	3	0.5	190	0.3	1	0.34	0.3	30	195	120	8.96	5	1	1.87	90	–	3.64
91-DU-3155	3155	0.6	6.76	3	1	240	0.3	1	0.62	0.3	51	180	241	8.7	5	0.5	1.46	100	–	2.68
91-DU-3157	3157	0.2	6.82	3	0.5	250	0.3	1	0.54	0.3	23	178	67	8.31	5	0.5	3.22	120	–	3.42
91-DU-3158	3158	0.1	5.86	3	2	190	0.3	1	0.55	0.5	21	141	142	9.88	5	1	1.5	150	–	2.61
91-DU-3159	3159	0.1	5.33	3	8	190	0.3	1	0.31	0.5	21	115	88	8.04	5	0.5	1.43	130	–	2.61

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-3045	3045	645	1	–	100	38	2	24	–	17	–	–	0.35	5	5	146	5	–	206	–
90-DU-3046	3046	600	3	–	88	42	4	24	–	12	–	–	0.33	20	5	154	5	–	182	–
90-DU-3049	3049	530	1	–	92	48	2	23	–	16	–	–	0.27	10	5	146	5	–	220	–
90-DU-3050	3050	705	1	–	79	40	4	22	–	12	–	–	0.14	10	5	138	5	–	160	–
90-DU-3050	3050	320	7	–	53	38	4	21	–	4	–	–	0.06	5	10	115	5	–	116	–
90-DU-3054	3054	405	11	–	59	48	2	16	–	7	–	–	0.16	10	5	144	5	–	178	–
90-DU-3055	3055	655	3	–	100	40	2	26	–	34	–	–	0.28	10	5	165	5	–	272	–
90-DU-3056	3056	580	4	–	103	46	4	22	–	11	–	–	0.26	10	5	157	5	–	240	–
90-DU-3057	3057	605	0.5	–	170	26	1	24	–	13	–	–	0.29	20	5	147	5	–	496	–
90-DU-3058	3058	735	3	–	116	64	2	23	–	10	–	–	0.34	10	5	164	5	–	412	–
90-DU-3063	3063	785	2	–	84	46	1	26	–	14	–	–	0.33	10	5	138	5	–	270	–
90-DU-3064	3064	735	2	–	57	70	2	19	–	15	–	–	0.16	20	5	102	5	–	258	–
90-DU-3064	3064	770	14	–	65	106	1	19	–	22	–	–	0.04	5	130	169	5	–	206	–
90-DU-3065	3065	605	0.5	–	77	40	1	23	–	13	–	–	0.26	10	5	131	5	–	172	–
90-DU-3067	3067	700	0.5	–	75	42	1	24	–	14	–	–	0.34	20	5	136	5	–	192	–
90-DU-3068	3068	550	0.5	–	68	56	6	20	–	15	–	–	0.25	20	5	132	5	–	276	–
90-DU-3071	3071	910	6	–	90	68	1	16	–	15	–	–	0.05	40	5	139	5	–	260	–
90-DU-3078	3078	455	3	–	76	42	2	18	–	14	–	–	0.13	10	5	127	5	–	266	–
90-DU-3080	3080	575	1	–	84	42	2	19	–	13	–	–	0.19	10	5	120	5	–	250	–
90-DU-3082	3082	550	1	–	104	38	4	22	–	13	–	–	0.15	10	5	119	5	–	258	–
90-DU-3086	3086	690	10	–	143	72	4	23	–	28	–	–	0.17	30	5	172	5	–	462	–
90-DU-3090	3090	685	5	–	109	48	1	21	–	23	–	–	0.27	20	5	141	5	–	276	–
90-DU-3093	3093	520	0.5	–	79	38	2	15	–	52	–	–	0.19	5	5	94	5	–	118	–
90-DU-3093	3093	15	0.5	–	31	148	4	4	–	64	–	–	0.01	5	5	79	50	–	26	–
90-DU-3095	3095	1185	2	–	92	62	1	23	–	17	–	–	0.22	30	5	147	5	–	278	–
90-DU-3096	3096	785	9	–	138	46	1	24	–	20	–	–	0.21	10	5	181	5	–	480	–
90-DU-3097	3097	680	1	–	95	64	8	18	–	36	–	–	0.13	5	5	122	5	–	436	–
90-DU-3097	3097	175	1	–	15	40	1	7	–	13	–	–	0.04	5	5	68	50	–	60	–
90-DU-3097	3097	160	21	–	12	18	1	7	–	9	–	–	0.06	5	5	68	5	–	44	–
90-DU-3102	3102	730	1	–	72	56	6	20	–	15	–	–	0.36	5	5	128	20	–	248	–
90-DU-3103	3103	855	4	–	82	42	1	18	–	15	–	–	0.13	10	5	138	10	–	202	–
90-DU-3104	3104	1015	3	–	121	52	4	22	–	14	–	–	0.24	30	5	171	10	–	218	–
90-DU-3109	3109	910	4	–	50	64	1	12	–	9	–	–	0.15	5	5	118	5	–	134	–
90-DU-3114	3114	1345	2	–	77	58	1	13	–	31	–	–	0.05	70	5	133	5	–	152	–
90-DU-3115	3115	860	1	–	46	52	1	9	–	34	–	–	0.04	70	5	89	5	–	90	–
90-DU-3117	3117	865	1	–	64	34	4	10	–	21	–	–	0.03	10	5	112	5	–	190	–
90-DU-3123	3123	760	7	–	110	100	2	10	–	9	–	–	0.15	30	5	102	5	–	106	–
90-DU-3130	3130	720	2	–	50	30	1	8	–	7	–	–	0.11	40	5	62	5	–	116	–
90-DU-3131	3131	1030	1	–	92	30	1	13	–	25	–	–	0.05	50	5	168	20	–	196	–
90-DU-3133	3133	650	3	–	233	24	1	11	–	16	–	–	0.04	10	5	128	5	–	190	–
90-DU-3138	3138	650	0.5	–	50	12	1	9	–	25	–	–	0.18	10	5	80	5	–	146	–
90-DU-3141	3141	875	1	–	40	42	1	10	–	24	–	–	0.12	40	5	103	5	–	106	–
90-DU-3142	3142	475	0.5	–	32	28	2	7	–	26	–	–	0.07	10	5	75	5	–	94	–
90-DU-3145	3145	915	3	–	61	40	1	15	–	18	–	–	0.11	20	5	135	10	–	168	–
90-DU-3146	3146	675	1	–	86	68	2	28	–	17	–	–	0.37	20	5	168	20	–	196	–
90-DU-3147	3147	765	1	–	103	70	4	31	–	12	–	–	0.28	10	5	179	10	–	228	–
90-DU-3149	3149	845	0.5	–	82	72	1	25	–	18	–	–	0.16	30	5	160	20	–	194	–
90-DU-3152	3152	1140	1	–	75	46	4	21	–	13	–	–	0.36	10	5	145	10	–	222	–
90-DU-3155	3155	995	2	–	127	56	1	17	–	12	–	–	0.1	20	5	131	10	–	170	–
90-DU-3157	3157	820	0.5	–	85	36	1	28	–	22	–	–	0.42	20	5	149	10	–	152	–
90-DU-3158	3158	485	6	–	101	54	1	22	–	26	–	–	0.2	20	5	164	10	–	266	–
90-DU-3159	3159	575	3	–	78	32	1	19	–	13	–	–	0.22	20	5	130	5	–	240	–

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
91-DU-3161	3161	0.8	6.52	3	0.5	260	0.5	1	0.47	0.5	28	143	82	8.85	5	0.5	1.43	130	–	2.73
91-DU-3163	3163	0.4	5.74	3	0.5	280	0.3	1	0.4	0.5	28	127	113	8.81	5	0.5	1.86	170	–	2.89
91-DU-3165	3165	0.6	6.43	3	0.5	290	0.3	1	0.42	0.3	32	173	96	9.14	5	0.5	2.21	150	–	3.53
91-DU-3167	3167	0.4	5.72	3	0.5	290	1.5	1	0.84	0.5	30	131	105	8.49	5	0.5	1.68	190	–	3.08
91-DU-3172	3172	0.4	5.85	3	0.5	220	0.3	1	0.28	0.3	31	131	70	8.49	5	0.5	1.81	90	–	2.63
91-DU-3173	3173	0.8	6.57	3	0.5	220	0.3	1	0.29	0.3	36	165	97	9.6	5	0.5	1.88	90	–	2.95
91-DU-3176	3176	1	7.38	26	10	210	1	1	0.36	0.3	38	206	167	11.29	5	0.5	2.9	70	–	3.49
91-DU-3180	3180	0.8	5.85	24	–	90	1.5	1	0.18	0.5	31	112	75	6.72	5	0.5	0.58	20	–	1.46
91-DU-3180	3180	4	4.06	3	–	160	0.3	1	0.07	0.3	1	163	197	16	5	0.5	2.28	20	–	1.61
91-DU-3181	3181	0.4	7.29	3	0.5	220	2	1	0.25	0.3	31	222	68	9.32	5	0.5	2.59	50	–	4.2
91-DU-3184	3184	0.4	6.46	16	0.5	140	1.5	1	0.42	0.3	28	148	53	5.88	5	0.5	2.01	50	–	3.44
91-DU-3186	3186	0.6	6.38	4	0.5	220	0.5	1	0.35	0.3	27	172	66	7.26	5	0.5	2.74	40	–	3.75
91-DU-3188	3188	0.8	6.5	144	2	290	0.3	1	0.76	0.3	42	179	234	8.8	5	0.5	2.25	80	–	3.52
91-DU-3192	3192	0.6	6.1	50	0.5	230	0.5	1	0.47	0.3	32	171	94	7.75	5	0.5	2.42	60	–	3.83
91-DU-3193	3193	0.4	6.72	4	2	190	1	1	0.47	0.3	28	161	168	6.89	5	0.5	2.58	60	–	4.16
91-DU-3197	3197	0.6	5.74	44	0.5	260	1	1	0.37	0.3	33	141	151	7.38	5	0.5	2.34	50	–	2.94
91-DU-3200	3200	0.6	6.77	3	15	250	1	1	0.12	0.3	33	200	113	8.46	5	0.5	2.65	30	–	3.36
91-DU-3202	3202	0.2	7.55	4	0.5	130	2	1	0.37	0.5	30	159	52	6.49	5	0.5	1.8	60	–	3.63
91-DU-3203	3203	0.6	7.07	28	0.5	160	2	1	0.39	0.3	31	162	68	6.73	5	0.5	2.08	60	–	3.98
91-DU-3205	3205	0.1	6.43	8	0.5	120	3.5	1	0.28	0.3	23	128	15	5.56	5	0.5	1.81	70	–	3.77
91-DU-3206	3206	0.8	6.49	70	2	190	1	1	0.41	0.3	38	167	141	9.28	5	0.5	1.95	70	–	3.31
91-DU-3207	3207	0.4	6.53	3	0.5	270	1.5	1	0.55	0.5	31	177	97	8.34	5	0.5	2.37	70	–	3.54
91-DU-3208	3208	1	6.45	3	0.5	430	0.5	1	0.53	0.3	47	162	183	10.55	5	0.5	1.87	150	–	3.27
91-DU-3210	3210	0.2	3.55	3	0.5	50	0.3	1	0.26	0.3	20	152	44	4.94	5	0.5	0.35	60	–	1.35
91-DU-3213	3213	0.6	7.23	3	0.5	440	2.5	1	0.54	0.5	24	121	79	9.68	5	0.5	1.86	170	–	2.71
91-DU-3214	3214	1	7.84	3	0.5	150	0.3	1	0.14	0.3	25	207	78	9.51	5	0.5	1.02	90	–	2.26
91-DU-3216	3216	0.6	8.13	3	0.5	160	0.3	1	0.18	0.3	33	144	77	9.29	5	0.5	1.17	120	–	2.87
91-DU-3221	3221	0.6	6.39	3	0.5	110	0.3	1	0.29	0.3	26	180	69	8.32	5	0.5	0.77	60	–	2.17
91-DU-3222	3222	0.6	6.54	8	0.5	290	0.3	1	0.66	0.3	34	173	122	9.45	5	0.5	2.44	200	–	3.49
91-DU-3226	3226	0.8	6.33	3	2	220	0.3	1	0.2	3	35	155	241	14.38	5	0.5	1.79	80	–	2.61
91-DU-3227	3227	1	7.83	3	0.5	260	0.3	1	0.59	0.5	32	207	82	8.67	5	0.5	2.87	70	–	4.13
91-DU-3228	3228	0.6	8.41	3	0.5	260	0.3	1	0.48	0.3	33	201	41	8.04	5	0.5	3.33	70	–	4.78
91-DU-3231	3231	0.4	5.51	3	0.5	130	0.3	1	0.51	0.3	37	213	107	9.74	5	0.5	1.09	150	–	3.47
91-DU-3233	3233	0.1	4.25	3	0.5	80	0.3	1	0.59	0.3	33	226	103	6.88	5	0.5	0.6	240	–	2.39
91-DU-3235	3235	1.2	6.53	3	7	250	0.3	1	0.46	0.3	35	177	168	10.57	5	0.5	1.74	180	–	3.23
91-DU-3238	3238	0.6	6.6	3	5	340	0.3	1	0.7	0.3	41	164	263	9.91	5	0.5	1.62	150	–	3.34
91-DU-3239	3239	1.2	6.58	3	5	240	0.3	1	0.48	0.3	36	209	201	9.39	5	0.5	1.95	140	–	3.06
91-DU-3241	3241	0.8	6.93	3	2	220	0.3	1	0.64	0.3	43	226	308	9.77	5	0.5	1.68	120	–	3.18
91-DU-3243	3243	0.8	6.74	3	0.5	340	0.3	1	0.4	0.3	36	209	158	10.38	5	0.5	2.17	120	–	3.46
91-DU-3247	3247	0.6	6.38	3	0.5	350	0.5	1	0.47	0.5	33	163	102	9.49	5	0.5	2.6	150	–	3.89
91-DU-3248	3248	0.1	6.16	3	0.5	240	0.3	6	0.54	0.3	30	169	148	9.7	5	0.5	2.48	90	–	3.69
91-DU-3250	3250	0.1	7	6	3	310	0.3	1	0.23	0.3	32	196	110	8.64	5	0.5	3.2	70	–	3.82
91-DU-3251	3251	0.1	6.3	3	0.5	260	0.3	2	0.32	0.3	35	255	129	9.66	5	0.5	2.8	230	–	3.72
91-DU-3252	3252	0.1	5.69	3	0.5	180	0.3	1	0.28	0.3	28	148	111	8.95	5	0.5	1.85	180	–	2.85
91-DU-3253	3253	0.4	5.68	3	0.5	190	0.3	4	0.83	0.3	29	149	151	8.54	5	0.5	1.16	320	–	3.44
91-DU-3255	3255	0.1	6.47	3	16	270	0.3	4	0.48	0.3	27	169	107	8.83	5	0.5	2.44	70	–	3.72
91-DU-3257	3257	0.1	5.79	3	0.5	240	0.3	8	0.46	0.3	30	169	122	8.19	5	0.5	2.24	100	–	3.51
91-DU-3260	3260	0.1	6.08	3	0.5	220	0.3	1	0.3	0.3	32	165	121	8.76	5	0.5	2.27	90	–	3.82
91-DU-3262	3262	1.4	3.19	3	0.5	60	0.3	1	0.16	0.3	21	68	53	5.02	5	0.5	0.43	180	–	0.93
91-DU-3264	3264	0.1	2.83	3	0.5	30	0.3	1	0.63	0.3	15	74	41	3.98	5	0.5	0.28	70	–	1.16
91-DU-3265	3265	0.1	6.28	3	–	240	0.3	8	0.3	1.5	32	136	247	11.51	5	0.5	1.46	140	–	2.61
91-DU-3267	3267	0.1	3.66	3	0.5	170	0.3	1	0.4	0.3	26	86	76	6.6	5	0.5	1.48	220	–	2.33

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-3161	3161	625	3	–	90	34	1	24	–	18	–	–	0.2	30	5	170	5	–	246	–
90-DU-3163	3163	660	3	–	88	34	1	22	–	14	–	–	0.24	40	5	155	10	–	276	–
90-DU-3165	3165	695	2	–	102	32	2	26	–	17	–	–	0.23	30	5	181	10	–	202	–
90-DU-3167	3167	570	3	–	97	44	1	22	–	21	–	–	0.12	40	5	157	10	–	238	–
90-DU-3172	3172	785	2	–	72	34	1	21	–	15	–	–	0.23	10	5	163	10	–	236	–
90-DU-3173	3173	860	5	–	86	42	1	22	–	15	–	–	0.24	20	5	182	10	–	256	–
90-DU-3176	3176	675	1	–	177	38	2	29	–	12	–	–	0.24	10	5	143	10	–	216	–
90-DU-3180	3180	855	4	–	126	56	2	11	–	16	–	–	0.16	10	5	121	5	–	334	–
90-DU-3180	3180	195	36	–	9	70	2	25	–	18	–	–	0.73	5	5	277	5	–	188	–
90-DU-3181	3181	725	2	–	122	24	1	26	–	8	–	–	0.28	10	5	179	5	–	116	–
90-DU-3184	3184	580	2	–	99	20	2	23	–	10	–	–	0.31	20	5	128	10	–	88	–
90-DU-3186	3186	625	0.5	–	102	28	1	25	–	11	–	–	0.38	5	5	146	5	–	124	–
90-DU-3188	3188	785	1	–	175	36	2	27	–	12	–	–	0.39	10	5	166	10	–	170	–
90-DU-3192	3192	805	1	–	103	32	2	26	–	11	–	–	0.41	10	5	153	10	–	122	–
90-DU-3193	3193	615	1	–	89	22	1	27	–	12	–	–	0.37	10	5	145	10	–	76	–
90-DU-3197	3197	735	2	–	101	26	1	19	–	10	–	–	0.1	10	5	131	10	–	134	–
90-DU-3200	3200	765	7	–	114	18	1	25	–	7	–	–	0.16	5	5	179	5	–	156	–
90-DU-3202	3202	495	4	–	96	28	1	22	–	9	–	–	0.3	10	5	140	10	–	82	–
90-DU-3203	3203	485	5	–	95	32	4	22	–	10	–	–	0.32	10	5	145	10	–	64	–
90-DU-3205	3205	475	2	–	76	36	1	19	–	8	–	–	0.26	20	5	113	5	–	50	–
90-DU-3206	3206	680	15	–	184	52	2	25	–	10	–	–	0.16	10	5	188	5	–	224	–
90-DU-3207	3207	770	1	–	103	50	1	25	–	12	–	–	0.19	5	5	161	5	–	248	–
90-DU-3208	3208	1635	4	–	99	66	4	23	–	19	–	–	0.19	60	5	180	10	–	278	–
90-DU-3210	3210	1195	1	–	39	44	1	8	–	11	–	–	0.16	5	5	98	5	–	78	–
90-DU-3213	3213	855	1	–	69	68	1	26	–	10	–	–	0.4	40	5	147	10	–	250	–
90-DU-3214	3214	545	2	–	65	56	4	15	–	12	–	–	0.33	20	5	164	5	–	166	–
90-DU-3216	3216	940	0.5	–	76	40	1	14	–	18	–	–	0.38	20	5	150	5	–	200	–
90-DU-3221	3221	680	0.5	–	64	44	2	13	–	21	–	–	0.3	5	5	145	5	–	142	–
90-DU-3222	3222	1020	1	–	109	62	1	25	–	13	–	–	0.44	40	5	169	10	–	240	–
90-DU-3226	3226	740	66	–	302	88	2	26	–	12	–	–	0.24	10	5	311	10	–	730	–
90-DU-3227	3227	665	2	–	124	48	2	33	–	17	–	–	0.5	5	5	165	5	–	206	–
90-DU-3228	3228	755	1	–	101	36	4	35	–	12	–	–	0.33	10	5	188	5	–	106	–
90-DU-3231	3231	1180	1	–	74	40	1	18	–	26	–	–	0.24	30	5	188	5	–	166	–
90-DU-3233	3233	1755	1	–	67	60	2	11	–	34	–	–	0.18	60	5	152	5	–	120	–
90-DU-3235	3235	1110	3	–	73	66	6	21	–	22	–	–	0.14	40	5	178	5	–	204	–
90-DU-3238	3238	1050	3	–	118	52	1	25	–	14	–	–	0.2	30	5	176	5	–	304	–
90-DU-3239	3239	915	2	–	95	56	2	22	–	15	–	–	0.29	30	5	163	5	–	210	–
90-DU-3241	3241	895	2	–	119	54	2	21	–	16	–	–	0.34	20	5	178	5	–	188	–
90-DU-3243	3243	895	2	–	85	52	2	24	–	17	–	–	0.32	20	5	194	5	–	208	–
90-DU-3247	3247	1075	0.5	–	97	88	1	26	–	9	–	–	0.47	30	5	173	5	–	274	–
90-DU-3248	3248	740	7	–	148	28	1	25	–	16	–	–	0.42	5	5	190	5	–	308	–
90-DU-3250	3250	865	3	–	94	28	1	27	–	9	–	–	0.52	5	5	186	5	–	116	–
90-DU-3251	3251	1085	2	–	102	54	1	23	–	13	–	–	0.47	5	5	178	5	–	240	–
90-DU-3252	3252	990	4	–	74	68	1	21	–	15	–	–	0.25	5	5	161	5	–	236	–
90-DU-3253	3253	790	1	–	71	50	1	17	–	23	–	–	0.18	5	5	153	5	–	222	–
90-DU-3255	3255	620	1	–	98	52	1	24	–	12	–	–	0.38	5	5	176	5	–	212	–
90-DU-3257	3257	840	1	–	120	40	1	22	–	13	–	–	0.35	5	5	170	5	–	268	–
90-DU-3260	3260	990	1	–	78	34	1	19	–	12	–	–	0.23	5	10	162	5	–	224	–
90-DU-3262	3262	1650	0.5	–	29	50	1	7	–	11	–	–	0.08	5	5	81	5	–	90	–
90-DU-3264	3264	700	1	–	26	16	2	8	–	21	–	–	0.06	5	5	77	5	–	60	–
90-DU-3265	3265	625	27	–	143	18	1	22	–	16	–	–	0.15	5	5	216	5	–	620	–
90-DU-3267	3267	895	0.5	–	47	20	1	13	–	25	–	–	0.07	5	5	106	5	–	154	–

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
91-DU-3269	3269	0.1	3.23	3		50	0.3	1	0.32	0.3	19	169	113	4.56	5	0.5	0.4	60	–	1.88
91-DU-3272	3272	0.1	5.65	6	0.5	250	0.3	1	0.34	0.3	38	168	129	7.92	5	0.5	1.46	100	–	2.99
91-DU-3274	3274	0.1	4.88	3	0.5	200	0.3	4	3.21	0.3	24	125	96	6.19	5	0.5	1.36	70	–	3
91-DU-3274	3274	3.8	0.84	14	0.5	30	0.3	8	0.07	0.3	5	84	90	16	5	0.5	3.83	5	–	0.62
91-DU-3276	3276	0.1	6.08	3	0.5	300	0.3	1	0.36	0.3	31	149	204	9.51	5	0.5	1.17	70	–	3.81
91-DU-3277	3277	0.1	5.39	3	0.5	370	0.3	2	1.03	0.3	30	129	187	9.03	5	0.5	1.67	70	–	3.62
91-DU-3278	3278	0.2	3.58	3	5	130	0.3	2	7.78	0.3	19	97	56	4.74	5	1	1.28	70	–	3.26
91-DU-3279	3279	0.6	5.18	3	0.5	250	0.3	4	0.53	0.3	32	129	123	10.63	5	0.5	0.97	170	–	2.88
91-DU-3281	3281	0.1	5.71	16	0.5	240	0.3	8	0.45	0.5	41	132	317	12.92	5	0.5	1.48	60	–	2.87
91-DU-3282	3282	0.2	5.7	3	0.5	430	0.3	2	0.37	0.3	38	76	107	7.94	5	0.5	1.26	230	–	3.31
91-DU-3283	3283	0.1	5.54	4	0.5	140	0.3	4	0.2	0.3	32	81	78	8.68	5	0.5	0.77	150	–	2.83
91-DU-3284	3284	0.2	3.3	3	0.5	160	0.3	1	10	0.3	13	78	56	4.19	5	0.5	1.23	110	–	2.85
91-DU-3285	3285	0.2	2.14	3	0.5	100	0.3	1	10	0.3	8	57	30	2.46	5	0.5	0.74	40	–	2.28
91-DU-3288	3288	0.4	4.38	3	0.5	210	0.3	1	0.43	0.3	33	116	311	6.98	5	0.5	1.33	160	–	2.81
91-DU-3290	3290	0.4	3.01	3	0.5	80	0.3	1	0.15	0.3	17	64	66	4.74	5	0.5	0.35	150	–	0.91
91-DU-3293	3293	0.2	5.21	3	0.5	440	0.3	1	0.53	0.3	25	119	97	7.68	5	0.5	1.57	160	–	5.61
91-DU-3295	3295	0.1	5.06	3	0.5	140	0.3	10	0.97	2	34	129	235	11.85	5	0.5	1.15	60	–	3.08
91-DU-3297	3297	0.1	5.18	3	2	280	0.3	2	2.2	0.3	24	117	106	7.22	5	0.5	1.27	100	–	4
91-DU-3300	3300	0.1	6.29	3	0.5	260	0.3	4	0.36	0.3	36	163	120	9	5	0.5	1.76	60	–	3.36
91-DU-3301	3301	0.1	5.49	3	0.5	250	0.3	4	0.52	0.3	41	251	132	8.89	5	0.5	1.66	100	–	3.56
91-DU-3304	3304	1.6	5.15	84	5	200	0.3	1	0.12	0.3	36	169	191	7.3	5	0.5	1.3	70	–	2.02
91-DU-3307	3307	0.1	6.86	10	0.5	240	0.3	8	0.32	0.3	33	191	134	9.75	5	0.5	2.18	60	–	3.31
91-DU-3309	3309	0.2	5.7	3	5	290	0.3	8	0.58	0.3	31	125	117	9.21	5	0.5	1.48	140	–	3.07
91-DU-3311	3311	0.1	4.06	3	0.5	120	0.3	1	0.6	0.5	28	102	90	4.84	5	0.5	0.64	140	–	1.5
91-DU-3312	3312	0.2	6.83	3	2	360	0.3	2	0.47	0.3	35	123	99	10.01	5	0.5	2.03	390	–	3.45
91-DU-3315	3315	0.1	6.54	3	0.5	410	0.3	6	0.48	0.3	36	133	152	10.08	5	0.5	1.94	180	–	3.42
91-DU-3317	3317	0.2	5.34	3	0.5	240	0.3	4	0.3	0.3	29	89	106	7.12	5	0.5	1.24	150	–	2.49
91-DU-3320	3320	0.4	5.55	26	8	220	0.3	4	0.31	0.3	30	128	230	13.24	5	0.5	0.94	80	–	2.45
91-DU-3321	3321	0.5	6.01	3	0.5	420	0.3	1	0.33	1.5	31	131	277	13.76	5	0.5	1.49	140	–	2.22
91-DU-3323	3323	0.7	5.94	3	4	450	0.3	1	0.32	0.3	36	123	194	10.84	5	0.5	1.71	300	–	2.69
91-DU-3324	3324	0.4	6.65	20	0.5	170	0.3	1	0.19	0.3	28	122	169	8.95	5	0.5	0.92	70	–	2
91-DU-3324	3324	2.5	2.44	4	2	10	0.3	1	0.06	1	2	96	281	16	5	0.5	0.23	5	–	0.7
91-DU-3327	3327	0.1	5.65	26	0.5	190	0.3	2	0.28	0.3	30	131	124	7.95	5	0.5	1.42	60	–	2.39
91-DU-3330	3330	0.1	6.52	38	3	200	0.3	1	0.19	0.3	39	188	149	9.67	5	0.5	2.4	30	–	2.75
91-DU-3331	3331	1.3	5.67	60	11	170	0.3	1	1.27	7.5	60	159	323	13.43	5	0.5	1.5	40	–	2.9
91-DU-3331	3331	4	3.15	3	5	100	0.3	1	0.06	1	7	176	123	16	5	0.5	1.27	5	–	1.52
91-DU-3334	3334	0.6	5.95	52	3	190	0.3	1	0.64	0.3	39	147	165	10.5	5	0.5	1.3	70	–	2.87
91-DU-3335	3335	0.2	6.39	84	6	180	0.3	1	0.66	0.3	37	172	173	9.53	5	0.5	1.87	110	–	3.89
91-DU-3337	3337	0.4	6.24	30	3	200	0.3	1	0.62	0.3	28	143	129	7.99	5	0.5	1.89	60	–	3.07
91-DU-3337	3337	4.5	0.86	20	0.5	50	0.3	1	0.07	0.5	6	44	189	16	5	0.5	0.7	5	–	0.16
91-DU-3338	3338	0.1	6.06	30	0.5	190	0.3	1	1.35	0.3	31	150	90	7.15	5	0.5	2.22	60	–	3.36
91-DU-3338	3338	3.5	2.1	3	4	40	0.3	1	0.04	0.5	3	75	130	16	5	0.5	0.74	5	–	0.39
91-DU-3341	3341	0.1	4.49	4	0.5	230	0.3	1	2.32	0.3	23	95	77	6.08	5	0.5	1.62	80	–	2.48
91-DU-3342	3342	0.2	5.12	3	7	200	0.3	2	3.09	0.3	24	109	95	6.96	5	0.5	1.29	120	–	2.78
91-DU-3344	3344	0.9	3.19	8	0.5	90	0.3	1	2.54	0.3	17	85	41	4.39	5	0.5	0.82	90	–	2.59
91-DU-3345	3345	0.1	4.6	26	0.5	200	0.3	1	6.05	0.3	23	118	84	5.98	5	0.5	1.63	120	–	3.35
91-DU-3346	3346	0.1	3.43	18	0.5	140	0.3	2	10	0.3	18	91	47	4.02	5	0.5	1.34	40	–	2.81
91-DU-3347	3347	4.4	1.18	50	51	100	0.3	1	0.08	1	5	92	163	16	5	0.5	1.14	10	–	0.52
91-DU-3348	3348	8.5	0.21	4	1	20	0.3	1	0.06	1.5	1	30	237	16	5	0.5	0.71	5	–	0.06
91-DU-3349	3349	4.7	1.35	3		30	0.3	1	0.06	0.5	3	111	129	16	5	0.5	3.82	5	–	0.95
91-DU-3350	3350	4.6	1.56	6	8	40	0.3	1	0.08	1	4	111	154	16	5	0.5	2.38	5	–	0.77
91-DU-3355	3355	1.4	5.02	64	4	70	0.3	1	0.07	0.3	15	134	226	16	5	0.5	0.67	20	–	1.88

Sample	Station	Mn ppm	Mo ppm	Nb ppm	Ni ppm	Pb ppm	Sb ppm	Sc ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Y ppm	Zn ppm	Zr ppm
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-3269	3269	790	1	–	42	20	1	7	–	15	–	–	0.15	5	5	104	5	–	70	–
90-DU-3272	3272	550	3	–	102	36	1	19	–	14	–	–	0.13	5	5	181	5	–	186	–
90-DU-3274	3274	415	0.5	–	91	26	1	16	–	66	–	–	0.12	5	5	132	5	–	208	–
90-DU-3274	3274	220	115	–	0.5	16	2	18	–	23	–	–	0.14	5	5	772	50	–	34	–
90-DU-3276	3276	515	5	–	102	32	1	23	–	17	–	–	0.09	5	5	209	5	–	294	–
90-DU-3277	3277	410	4	–	122	16	1	19	–	17	–	–	0.25	5	5	210	5	–	314	–
90-DU-3278	3278	375	0.5	–	54	20	1	12	–	68	–	–	0.23	5	5	113	5	–	134	–
90-DU-3279	3279	470	18	–	119	48	1	23	–	20	–	–	0.17	5	5	219	5	–	316	–
90-DU-3281	3281	570	36	–	249	14	1	23	–	20	–	–	0.09	5	5	333	5	–	530	–
90-DU-3282	3282	705	2	–	73	74	1	17	–	22	–	–	0.13	5	5	179	5	–	220	–
90-DU-3283	3283	835	2	–	59	56	1	15	–	12	–	–	0.2	5	5	177	5	–	270	–
90-DU-3284	3284	410	0.5	–	43	14	1	11	–	92	–	–	0.14	5	5	88	5	–	142	–
90-DU-3285	3285	270	0.5	–	29	2	1	7	–	115	–	–	0.11	5	5	54	5	–	70	–
90-DU-3288	3288	390	8	–	58	24	1	16	–	16	–	–	0.04	5	5	152	5	–	170	–
90-DU-3290	3290	795	0.5	–	25	46	1	7	–	7	–	–	0.1	5	5	70	5	–	96	–
90-DU-3293	3293	495	3	–	88	32	1	19	–	10	–	–	0.16	5	5	151	5	–	200	–
90-DU-3295	3295	655	23	–	220	20	1	19	–	23	–	–	0.06	5	5	222	5	–	696	–
90-DU-3297	3297	445	4	–	71	28	1	17	–	19	–	–	0.1	5	5	164	5	–	206	–
90-DU-3300	3300	665	1	–	99	12	1	21	–	14	–	–	0.18	5	5	196	5	–	216	–
90-DU-3301	3301	800	3	–	141	18	1	19	–	16	–	–	0.08	5	5	196	5	–	196	–
90-DU-3304	3304	605	37	–	128	26	1	13	–	16	–	–	0.04	5	5	163	5	–	136	–
90-DU-3307	3307	725	6	–	127	30	1	26	–	16	–	–	0.31	5	5	196	5	–	246	–
90-DU-3309	3309	700	2	–	90	32	1	22	–	12	–	–	0.27	5	5	178	5	–	316	–
90-DU-3311	3311	680	2	–	56	16	1	8	–	14	–	–	0.08	5	5	54	5	–	108	–
90-DU-3312	3312	895	0.5	–	73	44	1	28	–	24	–	–	0.06	5	5	199	5	–	182	–
90-DU-3315	3315	790	3	–	112	16	1	25	–	19	–	–	0.1	5	5	201	5	–	262	–
90-DU-3317	3317	870	1	–	52	26	1	13	–	14	–	–	0.06	5	5	127	5	–	172	–
90-DU-3320	3320	550	50	–	107	36	1	20	–	18	–	–	0.13	5	5	278	5	–	548	–
90-DU-3321	3321	565	42	–	98	58	1	21	–	87	–	–	0.04	5	5	230	5	–	494	–
90-DU-3323	3323	755	28	–	116	50	1	22	–	47	–	–	0.08	5	5	219	5	–	506	–
90-DU-3324	3324	470	23	–	86	32	1	19	–	22	–	–	0.11	5	5	186	10	–	368	–
90-DU-3324	3324	160	127	–	6	1	2	13	–	1	–	–	0.05	5	5	520	5	–	246	–
90-DU-3327	3327	675	3	–	92	36	1	19	–	13	–	–	0.24	5	5	149	5	–	198	–
90-DU-3330	3330	835	5	–	124	42	1	24	–	15	–	–	0.35	5	5	182	5	–	264	–
90-DU-3331	3331	1205	21	–	570	52	1	23	–	85	–	–	0.12	5	5	194	20	–	1958	–
90-DU-3331	3331	295	27	–	6	22	1	20	–	4	–	–	0.07	5	5	275	5	–	86	–
90-DU-3334	3334	660	19	–	219	40	1	22	–	19	–	–	0.11	5	5	199	10	–	380	–
90-DU-3335	3335	645	15	–	176	24	1	25	–	12	–	–	0.18	5	5	214	20	–	224	–
90-DU-3337	3337	620	2	–	115	14	1	21	–	13	–	–	0.17	5	5	149	10	–	230	–
90-DU-3337	3337	85	52	–	6	48	1	4	–	18	–	–	0.02	5	5	164	5	–	48	–
90-DU-3338	3338	660	2	–	92	20	1	22	–	16	–	–	0.34	5	5	148	10	–	150	–
90-DU-3338	3338	50	82	–	0.5	6	2	12	–	2	–	–	0.06	5	5	300	5	–	36	–
90-DU-3341	3341	450	1	–	63	16	1	15	–	27	–	–	0.31	5	5	119	20	–	166	–
90-DU-3342	3342	560	1	–	73	26	1	17	–	33	–	–	0.19	5	5	144	20	–	192	–
90-DU-3344	3344	805	2	–	47	30	1	9	–	40	–	–	0.04	5	5	86	10	–	122	–
90-DU-3345	3345	470	1	–	77	26	1	17	–	58	–	–	0.3	5	5	135	30	–	196	–
90-DU-3346	3346	350	0.5	–	55	4	4	11	–	81	–	–	0.24	5	5	93	30	–	98	–
90-DU-3347	3347	220	71	–	1	18	1	10	–	11	–	–	0.02	5	5	379	5	–	64	–
90-DU-3348	3348	10	72	–	3	1	2	4	–	39	–	–	0.02	5	5	346	5	–	42	–
90-DU-3349	3349	90	39	–	0.5	1	6	25	–	4	–	–	0.2	5	5	347	5	–	42	–
90-DU-3350	3350	55	47	–	0.5	1	1	18	–	5	–	–	0.03	5	5	271	5	–	40	–
90-DU-3355	3355	305	51	–	130	94	1	18	–	15	–	–	0.03	5	5	197	5	–	476	–

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		0.2	0.01	5	1	10	0.5	5	0.01	0.5	1	1	1	0.01	10	1	0.01	1	10	0.01
91-DU-3356	3356	0.1	8.1	86	2	100	0.3	1	0.38	0.3	42	164	145	8.6	5	0.5	1.84	40	–	4.46
91-DU-3357	3357	0.2	5.75	74	2	150	0.3	1	0.54	0.3	42	150	183	10.99	5	0.5	1.68	70	–	3.15
91-DU-3359	3359	0.2	6.29	3	3	230	0.3	1	0.18	0.3	38	166	161	9.24	5	0.5	2.06	40	–	2.27
91-DU-3362	3362	0.3	6.58	20	3	250	0.3	1	0.3	0.3	41	173	147	10.3	5	0.5	1.78	90	–	3.1
91-DU-3364	3364	0.6	6.44	8	–	1170	0.3	4	0.99	0.3	59	104	163	10.79	5	0.5	1.6	120	–	2.14
91-DU-3366	3366	0.1	3.47	3	0.5	170	0.3	1	0.28	0.3	28	68	95	5.14	5	0.5	0.61	100	–	1.52
91-DU-3370	3370	0.1	6.19	3	1	350	0.3	1	0.29	0.3	36	136	204	10.15	5	0.5	1.58	90	–	2.66
91-DU-3373	3373	0.1	4.34	8	0.5	210	0.3	2	0.4	0.3	21	96	114	6.35	5	0.5	1.01	110	–	2.23
91-DU-3375	3375	0.1	2.33	6	–	60	0.3	1	0.18	0.3	19	104	66	7.51	5	0.5	0.43	30	–	1.41
91-DU-3376	3376	0.1	5	3	0.5	420	0.3	1	0.74	0.3	31	108	141	8.38	5	0.5	1.69	210	–	3.45
91-DU-3379	3379	0.5	4.76	12	1	340	0.3	1	2.77	0.3	73	133	411	12.65	5	0.5	1.56	110	–	3.54
91-DU-3382	3382	0.4	5.25	3	0.5	320	0.3	1	0.66	1.5	37	113	215	11.96	5	0.5	1.23	100	–	2.31
91-DU-3383	3383	0.5	5.71	38	5	220	0.3	1	1.2	0.3	47	158	187	12.7	5	0.5	1.14	110	–	3.01
91-DU-3383	3383	2.8	3.57	12	0.5	230	0.3	1	0.06	0.3	8	91	231	16	5	0.5	1.24	5	–	0.69
91-DU-3384	3384	0.4	6.7	40	2	220	0.3	2	1.26	0.3	36	144	126	8.09	5	0.5	0.45	110	–	2.05
91-DU-3385	3385	0.3	6.24	32	–	230	0.3	1	0.15	0.3	31	165	168	8.7	5	0.5	1.38	40	–	2.63
91-DU-3387	3387	1.7	5.57	18	4	100	0.3	1	0.06	0.3	7	142	180	16	5	0.5	0.59	5	–	0.93
91-DU-3389	3389	0.7	6.4	54	2	140	0.3	1	0.33	0.3	42	152	222	11.1	5	6	1.24	40	–	2.79
91-DU-3392	3392	0.5	6.64	18	0.5	320	0.3	1	0.44	0.3	45	272	350	10.74	5	0.5	2.17	110	–	3.56
91-DU-3394	3394	0.2	5.79	3	5	150	0.3	1	0.8	0.3	35	150	168	8.67	5	4	1.59	140	–	3.41
91-DU-3398	3398	0.1	5.77	10	3	350	0.3	4	0.56	0.3	39	142	136	9.45	5	0.5	1.56	100	–	3.21
91-DU-3401	3401	0.1	6.74	12	1	230	0.3	1	0.42	0.3	32	172	139	8.63	5	0.5	2.55	40	–	3.58
91-DU-3403	3403	0.1	6.52	3	2	220	0.3	4	0.47	0.3	32	153	140	8.99	5	4	2.22	60	–	2.82
91-DU-3404	3404	0.2	7.08	44	4	210	0.3	2	0.37	0.3	34	171	131	8.56	5	0.5	2.42	60	–	3.56
91-DU-3407	3407	0.2	5.84	114	5	180	0.3	1	0.66	0.3	37	147	176	10.4	5	0.5	1.52	80	–	3.08
91-DU-3408	3408	0.2	6.92	12	2	180	0.3	1	0.22	0.3	31	171	141	9.87	5	0.5	2.3	40	–	3.19
91-DU-3409	3409	0.2	6.02	8	2	210	0.3	1	0.34	0.3	31	157	135	9.28	5	0.5	2.13	60	–	2.77
91-DU-3410	3410	0.3	6.55	8	0.5	180	0.3	1	0.18	0.3	35	169	125	9.35	5	0.5	2	30	–	2.77
91-DU-3411	3411	0.1	7.31	18	4	170	0.3	1	0.1	0.3	49	167	207	9.82	5	0.5	1.77	20	–	2.42
91-DU-3413	3413	0.2	4.85	20	3	140	0.3	1	0.35	0.5	24	114	124	7.68	5	0.5	1.27	40	–	1.83
91-DU-3415	3415	1.6	3.97	16	4	500	0.3	1	0.27	0.3	261	130	1626	12.54	5	0.5	0.71	20	–	2.98
91-DU-3417	3417	0.3	4.99	8	7	440	0.3	1	0.64	0.3	38	163	131	7.64	5	0.5	1.03	100	–	3.6
91-DU-3418	3418	0.2	4.33	3	0.5	310	0.3	1	0.78	0.3	30	133	88	6.39	5	3	1.14	90	–	2.82
91-DU-3423	3423	0.1	5.19	14	1	500	0.3	4	0.33	0.3	49	204	167	8.81	5	0.5	1.06	30	–	3.86
91-DU-3425	3425	0.5	6.56	8	–	550	0.3	1	0.47	0.3	63	77	239	7.89	5	2	0.75	70	–	2.77
91-DU-3427	3427	0.2	5.92	3	0.5	1030	0.3	2	0.36	0.3	46	167	114	9.54	5	0.5	1.64	180	–	3.28
91-DU-3429	3429	0.1	4.23	20	2	500	0.3	1	5.71	0.3	28	111	120	5.97	5	4	1.27	80	–	2.95
91-DU-3430	3430	0.1	5.17	4	0.5	480	0.3	1	0.35	0.3	44	82	118	10.39	5	3	1.74	350	–	2.95
91-DU-3431	3431	0.5	3.43	8	0.5	280	0.3	1	0.21	0.3	21	34	54	4.59	5	0.5	0.77	110	–	1.33
91-DU-3432	3432	0.2	6.62	3	3	420	0.3	1	0.14	0.3	29	61	105	9.16	5	0.5	1.26	180	–	2.46
91-DU-3433	3433	0.4	3.46	3	2	160	0.3	1	0.49	0.3	39	64	83	6.21	5	4	0.57	160	–	1.46
91-DU-3435	3435	0.5	3.92	3	3	240	0.3	1	0.44	0.3	34	133	75	7.89	5	0.5	0.77	130	–	1.8
91-DU-3436	3436	0.4	4.03	20	2	190	0.3	2	0.45	0.3	40	130	111	9.33	5	0.5	1.04	90	–	2.47
91-DU-3436	3436	1.4	4.88	6	8	60	0.3	1	0.07	0.3	11	87	438	16	5	1	0.38	10	–	0.8
91-DU-3437	3437	0.3	2.98	3	0.5	200	0.3	1	0.89	0.3	37	75	124	5.87	5	0.5	0.7	160	–	2.02
91-DU-3437	3437	2.8	0.36	16	25	140	0.3	1	0.06	0.3	8	218	102	16	5	0.5	4.64	5	–	0.36
91-DU-3438	3438	2.8	2.88	24	14	70	0.3	1	0.08	0.3	8	200	196	16	5	0.5	1.06	10	–	1.51
91-DU-3439	3439	1.4	0.6	190	10	10	0.3	2	0.08	0.3	13	59	110	16	5	0.5	0.37	5	–	0.16
91-DU-3440	3440	3.4	2.99	16	13	100	0.3	1	0.08	0.5	5	137	189	16	5	0.5	1.39	5	–	1.52
91-DU-3441	3441	3.4	3.13	18	7	410	0.3	1	0.16	0.5	4	204	212	16	5	0.5	0.57	20	–	0.68
91-DU-3443	3443	3.6	4.88	18	5	160	0.3	1	0.09	0.3	11	83	308	16	5	0.5	0.49	20	–	0.84
91-DU-3445	3445	1.3	0.03	30	3	10	0.3	1	0.08	1	6	17	324	16	5	0.5	0.1	5	–	0.01

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		5	1	5	1	2	5	1	20	1	10	10	0.01	10	10	1	10	1	2	5
90-DU-3356	3356	490	20	–	152	30	1	25	–	8	–	–	0.14	5	5	211	10	–	88	–
90-DU-3357	3357	680	20	–	230	40	1	22	–	18	–	–	0.18	5	5	199	5	–	422	–
90-DU-3359	3359	800	8	–	100	30	1	22	–	32	–	–	0.13	5	5	170	5	–	178	–
90-DU-3362	3362	995	8	–	128	44	1	24	–	18	–	–	0.2	5	5	201	5	–	274	–
90-DU-3364	3364	450	1	–	69	14	1	18	–	74	–	–	0.23	5	5	94	5	–	184	–
90-DU-3366	3366	565	3	–	46	30	1	8	–	11	–	–	0.14	5	5	89	5	–	138	–
90-DU-3370	3370	780	17	–	124	26	1	24	–	19	–	–	0.29	5	5	218	5	–	428	–
90-DU-3373	3373	400	3	–	118	24	1	16	–	10	–	–	0.24	5	5	106	5	–	166	–
90-DU-3375	3375	450	4	–	38	20	1	7	–	8	–	–	0.15	5	5	138	5	–	92	–
90-DU-3376	3376	665	3	–	95	26	1	20	–	23	–	–	0.27	5	5	161	10	–	276	–
90-DU-3379	3379	745	12	–	258	44	1	20	–	58	–	–	0.12	5	5	175	10	–	530	–
90-DU-3382	3382	630	17	–	157	22	4	17	–	20	–	–	0.19	5	5	173	5	–	604	–
90-DU-3383	3383	690	10	–	162	20	1	27	–	32	–	–	0.11	5	5	188	5	–	338	–
90-DU-3383	3383	100	24	–	13	16	2	26	–	12	–	–	0.12	5	5	302	5	–	64	–
90-DU-3384	3384	1865	3	–	108	46	1	14	–	27	–	–	0.24	5	5	170	10	–	170	–
90-DU-3385	3385	380	6	–	105	36	1	20	–	10	–	–	0.3	5	5	185	5	–	232	–
90-DU-3387	3387	90	49	–	15	4	1	21	–	2	–	–	0.06	5	5	267	5	–	108	–
90-DU-3389	3389	705	30	–	235	46	1	26	–	13	–	–	0.26	5	5	239	5	–	472	–
90-DU-3392	3392	935	5	–	117	38	1	23	–	13	–	–	0.28	5	5	225	5	–	168	–
90-DU-3394	3394	900	3	–	70	30	1	20	–	26	–	–	0.27	5	5	180	5	–	162	–
90-DU-3398	3398	995	4	–	121	80	1	23	–	12	–	–	0.21	5	5	181	5	–	450	–
90-DU-3401	3401	640	3	–	126	60	1	24	–	18	–	–	0.38	5	5	164	5	–	276	–
90-DU-3403	3403	615	4	–	117	32	1	24	–	20	–	–	0.26	5	5	153	5	–	254	–
90-DU-3404	3404	620	4	–	115	22	1	27	–	10	–	–	0.39	5	5	167	5	–	162	–
90-DU-3407	3407	600	16	–	200	42	4	23	–	21	–	–	0.24	5	5	190	5	–	306	–
90-DU-3408	3408	790	5	–	114	30	1	26	–	12	–	–	0.4	5	5	195	5	–	250	–
90-DU-3409	3409	690	4	–	100	46	2	24	–	17	–	–	0.3	5	5	171	5	–	248	–
90-DU-3410	3410	610	6	–	104	44	1	25	–	15	–	–	0.42	5	5	183	5	–	204	–
90-DU-3411	3411	620	8	–	144	30	1	24	–	13	–	–	0.34	5	5	173	5	–	236	–
90-DU-3413	3413	405	11	–	127	28	1	19	–	16	–	–	0.17	5	5	162	5	–	318	–
90-DU-3415	3415	4135	2	–	231	32	1	15	–	12	–	–	0.09	5	5	140	5	–	248	–
90-DU-3417	3417	890	0.5	–	129	24	1	22	–	23	–	–	0.18	5	5	131	5	–	206	–
90-DU-3418	3418	480	0.5	–	90	6	1	18	–	31	–	–	0.31	5	5	119	5	–	186	–
90-DU-3423	3423	1220	1	–	193	16	1	23	–	20	–	–	0.32	5	5	140	5	–	226	–
90-DU-3425	3425	1410	0.5	–	124	14	1	19	–	27	–	–	0.03	5	5	139	5	–	164	–
90-DU-3427	3427	1015	2	–	129	36	2	19	–	28	–	–	0.09	5	5	182	5	–	210	–
90-DU-3429	3429	505	0.5	–	67	18	2	13	–	58	–	–	0.33	5	5	119	20	–	156	–
90-DU-3430	3430	1095	2	–	58	40	1	20	–	25	–	–	0.09	5	5	182	5	–	244	–
90-DU-3431	3431	660	1	–	22	26	1	7	–	13	–	–	0.12	5	5	73	5	–	114	–
90-DU-3432	3432	845	1	–	38	32	1	19	–	17	–	–	0.34	5	5	144	5	–	206	–
90-DU-3433	3433	1530	2	–	37	38	1	9	–	24	–	–	0.05	5	5	121	5	–	122	–
90-DU-3435	3435	1200	3	–	67	26	1	11	–	26	–	–	0.02	5	5	130	5	–	150	–
90-DU-3436	3436	645	0.5	–	88	10	1	17	–	18	–	–	0.21	5	5	194	5	–	182	–
90-DU-3436	3436	160	28	–	35	56	4	11	–	9	–	–	0.12	5	5	92	5	–	100	–
90-DU-3437	3437	830	0.5	–	60	26	1	15	–	33	–	–	0.07	5	5	109	5	–	114	–
90-DU-3437	3437	30	10	–	0.5	1	4	22	–	16	–	–	0.64	5	5	676	5	–	4	–
90-DU-3438	3438	265	56	–	5	42	4	23	–	3	–	–	0.03	5	5	430	5	–	64	–
90-DU-3439	3439	10	3	–	19	1	1	8	–	0.5	–	–	0.01	5	5	93	5	–	2	–
90-DU-3440	3440	275	119	–	8	22	1	23	–	12	–	–	0.02	5	5	408	5	–	68	–
90-DU-3441	3441	75	99	–	9	1	1	22	–	52	–	–	0.04	5	5	700	5	–	72	–
90-DU-3443	3443	215	63	–	31	54	1	13	–	8	–	–	0.07	5	5	175	5	–	174	–
90-DU-3445	3445	5	0.5	–	0.5	1	4	3	–	0.5	–	–	0.01	5	5	30	5	–	6	–

Appendix D. (cont.)

Sample	Station	Ag (ppm)	Al (%)	As (ppm)	Au (ppb)	Ba (ppm)	Be (ppm)	Bi (ppm)	Ca (%)	Cd (ppm)	Co (ppm)	Cr (ppm)	Cu (ppm)	Fe (%)	Ga (ppm)	Hg (ppm)	K (%)	La (ppm)	Li (ppm)	Mg (%)
Detection limit		**0.2**	**0.01**	**5**	**1**	**10**	**0.5**	**5**	**0.01**	**0.5**	**1**	**1**	**1**	**0.01**	**10**	**1**	**0.01**	**1**	**10**	**0.01**
91-DU-3446	3446	3.3	2.8	20	7	130	0.3	1	0.07	0.5	8	221	128	16	5	0.5	1.46	5	–	1.5
91-DU-3447	3447	20	0.1	16	2	30	0.3	4	0.07	0.5	2	13	108	16	5	0.5	2.4	5	–	0.01
91-DU-3448	3448	5	1.95	20	10	70	0.3	1	0.07	0.5	4	128	128	16	5	0.5	3.3	40	–	1.37
91-DU-3449	3449	8.6	0.65	44	9	30	0.3	1	0.07	0.3	4	90	144	16	5	0.5	2.46	5	–	0.38
91-DU-3450	3450	1.5	2.16	6	0.5	50	0.3	1	0.07	0.5	9	58	131	16	5	0.5	0.65	5	–	0.64
91-DU-3451	3451	2	1.23	3	0.5	5	0.3	1	0.08	1.5	4	54	444	16	5	0.5	0.07	5	–	0.16
91-DU-3452	3452	3.5	1.85	34	–	60	0.3	1	0.06	0.3	5	88	43	16	5	0.5	2.05	5	–	0.72
91-DU-3453	3453	5	0.39	32	20	30	0.3	1	0.07	1	3	24	161	16	5	0.5	1.88	5	–	0.12
91-DU-3454	3454	0.2	0.04	24	–	30	0.3	1	0.09	0.3	16	3	291	16	5	0.5	2.07	5	–	0.06
91-DU-3454	3454	0.4	0.09	46	22	5	0.3	1	0.07	1	3	7	177	16	5	0.5	0.02	5	–	0.06
91-DU-3455	3455	1.3	1.1	56	8	30	0.3	1	0.08	0.3	5	41	112	16	5	0.5	2.33	5	–	0.51
91-DU-3456	3456	0.4	0.67	16	4	30	0.3	1	0.08	0.3	27	29	94	16	5	0.5	2.39	5	–	0.21
91-DU-3457	3457	4.7	1.86	18	6	110	0.3	1	0.09	1	3	52	90	16	5	0.5	3.3	40	–	0.59
91-DU-3458	3458	2	1.7	14	10	130	0.3	1	0.06	0.5	6	122	160	16	5	0.5	3.76	30	–	1.26
91-DU-3459	3459	3.2	3.8	26	6	60	0.3	1	0.04	0.5	6	140	89	16	5	0.5	0.92	10	–	1.09
91-DU-3460	3460	0.4	1.48	4	0.5	40	0.3	1	2.5	0.5	8	56	32	2.16	5	0.5	0.28	20	–	1.66
91-DU-3462	3462	0.1	3.87	16	0.5	160	0.3	1	1.22	0.3	20	113	35	5.52	5	2	1.69	110	–	3.05
91-DU-3463	3463	0.2	3.2	8	2	150	0.3	1	3.75	0.3	17	95	27	4.2	5	0.5	1.47	80	–	4.11
91-DU-3464	3464	0.2	3.51	3	0.5	130	0.3	1	2.79	0.3	19	112	27	5.29	5	0.5	1.33	90	–	3.7
91-DU-3465	3465	0.3	3.48	3	0.5	130	0.3	2	3.76	0.3	20	115	35	4.9	5	7	1.52	90	–	4.38
91-DU-3466	3466	0.2	2.28	4	0.5	80	0.3	1	7.25	0.3	11	68	18	3.08	5	0.5	0.75	60	–	5.63
91-DU-3473	3473	0.1	3.14	6	0.5	110	0.3	2	4.37	0.3	20	104	34	3.95	5	2	0.99	80	–	4.36
91-DU-3478	3478	0.2	3.62	3	4	160	0.3	1	3.51	0.3	23	10^{6}	45	4.87	5	0.5	1.43	90	–	3.38
91-DU-3479	3479	0.2	3.53	12	4	160	0.3	1	1.97	0.3	20	101	29	4.67	5	0.5	1.6	100	–	3.21

Sample	Station	Mn (ppm)	Mo (ppm)	Nb (ppm)	Ni (ppm)	Pb (ppm)	Sb (ppm)	Sc (ppm)	Sn (ppm)	Sr (ppm)	Ta (ppm)	Te (ppm)	Ti (%)	Tl (ppm)	U (ppm)	V (ppm)	W (ppm)	Y (ppm)	Zn (ppm)	Zr (ppm)
Detection limit		**5**	**1**	**5**	**1**	**2**	**5**	**1**	**20**	**1**	**10**	**10**	**0.01**	**10**	**10**	**1**	**10**	**1**	**2**	**5**
90-DU-3446	3446	315	84	–	2	16	1	18	–	3	–	–	0.02	5	5	329	5	–	64	–
90-DU-3447	3447	15	8	–	2	16	2	2	–	31	–	–	0.04	5	5	49	5	–	2	–
90-DU-3448	3448	175	43	–	4	14	1	20	–	91	–	–	0.03	5	5	275	5	–	96	–
90-DU-3449	3449	105	154	–	0.5	1	2	14	–	18	–	–	0.02	5	5	1096	5	–	14	–
90-DU-3450	3450	165	29	–	31	48	2	11	–	4	–	–	0.02	5	5	1219	5	–	122	–
90-DU-3451	3451	50	0.5	–	6	30	1	7	–	2	–	–	0.01	5	5	37	5	–	226	–
90-DU-3452	3452	105	166	–	0.5	4	6	10	–	20	–	–	0.02	5	5	1053	5	–	38	–
90-DU-3453	3453	20	24	–	2	12	1	4	–	7	–	–	0.01	5	5	518	5	–	14	–
90-DU-3454	3454	15	1	–	42	1	1	3	–	15	–	–	0.01	5	5	42	5	–	1	–
90-DU-3454	3454	10	3	–	0.5	1	2	2	–	0.5	–	–	0.01	5	5	0.5	5	–	1	–
90-DU-3455	3455	105	14	–	22	36	1	9	–	55	–	–	0.02	5	5	97	5	–	82	–
90-DU-3456	3456	40	3	–	17	28	2	5	–	18	–	–	0.01	5	5	67	5	–	6	–
90-DU-3457	3457	65	132	–	7	18	2	13	–	88	–	–	0.03	5	5	141	5	–	4	–
90-DU-3458	3458	130	21	–	4	38	4	20	–	22	–	–	0.06	5	5	149	5	–	58	–
90-DU-3459	3459	140	48	–	16	238	2	17	–	7	–	–	0.06	5	5	234	5	–	128	–
90-DU-3460	3460	470	2	–	30	28	1	2	–	14	–	–	0.04	5	5	44	5	–	72	–
90-DU-3462	3462	650	0.5	–	52	12	1	15	–	28	–	–	0.29	5	5	104	5	–	140	–
90-DU-3463	3463	525	0.5	–	42	6	2	11	–	37	–	–	0.15	5	5	86	10	–	114	–
90-DU-3464	3464	535	2	–	48	14	1	12	–	21	–	–	0.17	5	5	100	5	–	130	–
90-DU-3465	3465	565	1	–	50	20	1	12	–	26	–	–	0.14	5	5	95	10	–	124	–
90-DU-3466	3466	405	1	–	28	6	2	7	–	23	–	–	0.17	5	5	60	20	–	82	–
90-DU-3473	3473	475	0.5	–	42	26	4	11	–	21	–	–	0.15	5	5	80	10	–	132	–
90-DU-3478	3478	595	0.5	–	50	30	1	12	–	30	–	–	0.24	5	5	90	5	–	122	–
90-DU-3479	3479	590	1	–	42	16	1	13	–	33	–	–	0.18	5	5	95	5	–	124	–

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